Haley & Aldrich of New York
200 Town Centre Drive
Suite 2
Rochester, NY 14623

Tel: 585.359.9000
Fax: 585.359.4650
HaleyAldrich.com

HALEY & ALDRICH

24 February 2014
File No. 28612-302

Atlantic Richfield Company
150 West Warrenville Road
Naperville, IL 60563

Attention: Paul Johnson, P.G.

Subject: Remedial Design Work Plan
Former Anaconda Wire and Cable Company

Hastings-on-Hudson, New York
Site No. #3-60-022

Dear Paul:

The attached Remedial Design Work Plan (RDWP) has been prepared in accordance with the requirements of the 2013 Amended Order on Consent and DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010) for submittal to the New York State Department of Environmental Conservation.

Sincerely yours,
HALEY & ALDRICH OF NEW YORK

Wayne Hardison

Wayne C. Hardison, P.E.
Program Manager

Enclosures

https://hank.haleyaldrich.com/sites/projects/28612/Shared Documents/RDWP/RDWP Text/2014-0220-wch-RDWP Text-DF.docx

REMEDIAL DESIGN WORK PLAN
FORMER ANACONDA WIRE AND CABLE COMPANY SITE
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK
NYSDEC SITE #3-60-022

by

Haley & Aldrich of New York
Rochester, New York

for

Atlantic Richfield Company
Naperville, Illinois

File No. 28612
24 February 2014

HALEY& ALDRICH

Haley & Aldrich of New York
200 Town Centre Drive
Suite 2
Rochester, NY 14623

Tel: 585.359.9000
Fax: 585.359.4650
HaleyAldrich.com

HALEY & ALDRICH

24 February 2014
File No. 28612-302

Mr. William T. Ports, P.E.
New York State Department Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7014

Subject: Remedial Design Work Plan
Former Anaconda Wire and Cable Company
One River Street
Hastings-on-Hudson, New York
Site No. #3-60-022

Dear Mr. Ports:

Haley & Aldrich of New York (Haley & Aldrich) is pleased to submit this Remedial Design Work Plan, prepared for the Former Anaconda Wire and Cable Company site located at 1 River Street, Hastings on Hudson, New York.

I, Wayne Hardison certify that I am currently a NYS registered professional engineer and that this Remedial Design Work Plan was prepared in accordance with the applicable statues and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

PROFESSIONAL ENGINEER CERTIFICATION

Signature: Wayne Hardison

Name: _Wayne C. Hardison, P.E.______

Title: _Program Manager_____________

Lic. State/#: _067080_____________________

Date: _24 February 2014_____________

Engineer's

Please contact us if you have questions.

Sincerely yours,
HALEY & ALDRICH OF NEW YORK

Wayne Hardison

Wayne C. Hardison, P.E.
Program Manager

c: Atlantic Richfield; Attn.: Mr. Paul Johnson

EXECUTIVE SUMMARY

This Remedial Design Work Plan (RDWP) describes the activities required to prepare a remedial design in accordance with the 2013 Amended Order on Consent. The RDWP has also been prepared in accordance with DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010) Section 5.2, Remedial Design. This RDWP is organized into sections as summarized below.

Pre-Design Investigation (PDI)

The tasks for PDI include borings, test pits, utility location, bench tests, delineation of remedial excavation extents, and delineation of remedial dredge extents. Data will also be collected to support updates to the site groundwater model. A determination whether any required pilot tests are required will be made during design and supplemental work plans submitted separately. Appendices are provided which include specific technical details for each activity.

Appendices also include the Quality Assurance Project Plan (QAPP) and Community Air Monitoring Plan (CAMP) for the PDI. The Health & Safety Plan will be developed prior to mobilization in accordance with site-specific requirements.

Remedial Design

The remedial design section provides an overview of the design process. The final details regarding specific drawings and specifications will be developed during the design and submitted as a Final Design. In general, the goal of the design process is to develop documents for construction of the remedy.

This section also discusses specific plans that will be developed as part of the design including the Remedial Action Monitoring Plan (RAMP), Community and Environmental Response Plan (CERP), and the construction phase CAMP.

Permits

This section identifies required permits, exempted permits or other authorizations for the remedial action. This project requires Federal, State and local permits including a Joint Permit Application.

Schedule

This section describes the schedule for the completion of the PDI and design.

Post-Construction Plans

This section identifies the plans and actions currently known to be required following construction. Specific plans, including the Site Management Plan (SMP), will be developed and submitted separately.

Site Figures

The activities conducted as part of the PDI will further refine the understanding of the scope of the remedy. As indicated in DER-10 Section 5.2, scaled site maps which identify areas where remedial actions will be conducted as well as locations, depths, and concentrations of contaminants are provided in Appendix C of this RDWP. The included maps have been previously presented as Figures in two documents: the Revised Feasibility Study (RFS) and the OU-2 ROD.

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1. INTRODUCTION

1.1 Site Location and Description

The Site is located on the eastern bank of the Hudson River within the confines of the Hudson River Valley (Figure 1). The ground surface at the Site is relatively flat with ground surface predominantly ranging from approximately El. 3 to El. 11.

The Site consists of two Operable Units, OU-1 and OU-2. OU-1 is an upland area approximately 2,400 feet long by 500 feet wide. OU-2 is the area that extends westward into the Hudson River approximately 400 feet from the western OU-1 boundary, north into the Old Marina (approximately 300 feet north of the northwestern corner of OU-1), and approximately parallel to the southern property boundary. OU-1 and OU-2 boundaries are described in the Record of Decision (ROD) (NYSDEC, 2012), also see Appendix C Site Figures.

The Hudson River is considered a drowned-river estuary. The river is approximately 4,800 feet wide at the Site with a maximum depth of about 50 feet at midstream. There is no navigation channel specified at the Site's location along the river. Based on historical studies the currents vary from about 2.2 fps on the flood tide (flowing upstream) to about 2.9 fps on the ebb tide (flowing downstream). Depending on wind direction and velocity, wave heights of 3 feet to 5 feet and wakes of passing vessels of 2.5 feet have been observed. During the winter, ice floes may accumulate along the eastern shore of the Hudson River when there is a strong west wind.

1.2 Site History

The on-shore portion of the Site (OU-1) was created by filling the Hudson River between the mid-1800s and the early 1900s with the placement of uncontrolled fill. The western edge of the fill progressively utilized a series of bulkhead walls of various construction types. These bulkhead walls establish the boundaries of OU-1 and some elements of the off-shore portion of the Site (OU-2). Buildings at the Site were supported by piles likely driven to or into the Basal Sand, which is a sand unit located at depths ranging from 10 feet to more than 70 feet below ground surface (bgs). The Site was primarily used as an industrial facility for well over a century. Buildings were added and demolished since the Site's original development.

During World War II, Anaconda Wire and Cable Company (AWC) was awarded contracts from the U.S. Navy (Navy) to manufacture electric cable for shipboard use. The Navy required the insulation of shipboard cable to be heat and flame resistant to avoid fire damage and to withstand heat generated from conducting high electric currents. PCB mixtures were used to make these products for the Navy. The material was used exclusively during the World War II-era and PCB use in the manufacturing of cable was suspended after AWC's contracts with the Navy were fulfilled at the end of the war, as there was no civilian market for these products. After World War II, AWC produced electrical and television cable until it ceased operations in 1975. Atlantic Richfield purchased AWC in 1977, never operated the plant, and then sold the Site in 1978. Since 1978, several owners and tenants subsequently occupied the Site. In 1998, AR's affiliate, ARCO Environmental Remediation Limited (AERL), purchased the Site in order to facilitate environmental investigation and remediation efforts.

As of 2013, Building 52 and the water tower are the only remaining structures on the Site. Building 52 is located in the northeastern corner of the Site. All other buildings have been demolished with only the slabs remaining. All tenants have vacated the Site.

1.3 Remedial Investigation and Feasibility Study Summary

Since 1998, AR and AERL have implemented remedial investigations, Interim Remedial Measures (IRM) and demolition activities as part of the remedial process. NYSDEC issued a Record of Decision (ROD) for the OU-1 portion of the Site in March 2004 (NYSDEC, 2004). In March 2003 the Final Feasibility Study Report (FS) for OU-2 was prepared and submitted by Earth Tech of New York, Inc. (Earth Tech) (Earth Tech, 2003) based on the December 2000 Remedial Investigation Report (RI) for OU-2 (Earth Tech, 2000).

In October 2003, NYSDEC issued the Proposed Remedial Action Plan (PRAP) for OU-2 (NYSDEC, 2003). Subsequent investigations completed by Parsons lead to the necessity for updating the 2003 OU-2 FS. The Supplemental Feasibility Study Report for Operable Unit No. 2 (SFS) was completed and submitted to NYSDEC in April 2006 (Parsons, 2006). In 2009, a Modified Feasibility Study Report (MFS) was prepared and submitted to NYSDEC (Haley & Aldrich, 2009), which incorporated additional new data and analyses with the intent to fully integrate OU-2 and OU-1 remedial activities. In 2011, a Revised Feasibility Study (RFS) was submitted (Haley & Aldrich, 2011) to address proposed amendments to the OU-1 ROD and the integrated remedies for OU-1 and OU-2.

On 30 March 2012 NYSDEC issued an amended ROD for OU-1 and a ROD for OU-2. The Amended Order on Consent was signed 6 November 2013.

1.4 Active Interim Remedial Measures

Two Interim Remedial Measures (IRM) have been undertaken at the Site that are currently active. The active IRMs are LNAPL recovery and DNAPL recovery. LNAPL is recovered periodically from select wells located near the North Boat Slip in the vicinity of the former boiler house. DNAPL is recovered periodically from select wells installed in the Northwest Onshore Area (see Figure 2).

1.5 Project Goals and Objectives

The OU-1 ROD Amendment states that:

The goals selected for this site are:

- *Reduce, control, or eliminate to the extent practicable the contamination present within the soils and fill on site, and thereby eliminate the significant threat posed by the presence of hazardous wastes at the site.*
- *Eliminate the potential for direct human or animal contact with the contaminated soils or groundwater on site.*
- *Eliminate the threat to surface waters and sediments by eliminating surface run-off and subsurface releases of fill from the site.*

- *Eliminate, to the extent practicable, the migration of PCBs, metals and other contaminants into the Hudson River by surface and subsurface erosion of contaminated soils, transport of contaminated groundwater, and migration of PCBs in both elastic material and petroleum phases.*

- *Prevent, to the extent possible, migration of contaminants at the site to groundwater and surface water.*

Further, the remediation goals for the site include attaining to the extent practicable:

- *Provide for attainment of SCGs for groundwater quality at the limits of the site.*

The OU-2 ROD states:

The remedial action objectives for this site are:

Surface Water

RAOs for Public Health Protection

- *Prevent surface water contamination which may result in fish advisories.*

RAOs for Environmental Protection

- *Restore surface water to ambient water quality criteria for the contaminant of concern.*

- *Prevent impacts to biota from ingestion/direct contact with surface water causing toxicity and impacts from bioaccumulation through the marine or aquatic food chain.*

Sediment

RAOs for Public Health Protection

- *Prevent direct contact with contaminated sediments.*

- *Prevent surface water contamination which may result in fish advisories.*

RAOs for Environmental Protection

- *Prevent releases of contaminant(s) from sediments that would result in surface water levels in excess of (ambient water quality criteria).*

- *Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain.*

- *Restore sediments to pre-release/background conditions to the extent feasible.*

1.5.1 Standards, Criteria and Guidance

A more detailed list of SCGs is provided on NYSDEC Website titled "Index of Standards, Criteria and Guidance (SCGs) for Investigation and Remediation of Inactive Hazardous Waste Disposal Sites. Applicable SCGs for the Site were utilized from the following sources.

- Part 375 – Environmental Remediation Programs. NYSDEC's regulations concerning remedial programs for Inactive Hazardous Waste Disposal Sites.
- Related NYSDEC technical and administrative guidance including DER-10 and Technical and Operational Guidance (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.
- Part 700-706 – Water Quality Regulations for Surface Waters and Groundwater.
- NYSDEC Fish, Wildlife and Marine Resource Guide Documents, including Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC, 1994), NYSDEC Shoreline Protection Guidance (NYSDEC, 2007), and Technical Guidance for Screening of Contaminated Sediments (NYSDEC, 1999).

1.6 Selected Remedy

The selected remedy is described in the OU-1 ROD Amendment and the OU-2 ROD. Excerpts are provided below. Appendix C includes figures from the RFS and the OU-2 ROD that describe the remedy.

1.6.1 OU-1

The 2012 ROD Amendment resulted from new data that had been obtained. The elements of the OU-1 (on-shore) remedy are as follows:

"The elements of the amended remedy listed below are identified as unchanged, modified or new when compared to the original 2004 ROD:

1. *A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Green remediation principals and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:*

    - *Considering the environmental impacts of treatment technologies and remedy stewardship over the Longterm;*
    - *Reducing direct and indirect greenhouse gas and other emissions;*
    - *Increasing energy efficiency and minimizing use of non-renewable energy;*
    - *Conserving and efficiently managing resources and materials;*
    - *Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;*
    - *Maximizing habitat value and creating habitat when possible;*

- *Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and*
- *Integrating the remedy with the end use where possible and encouraging green and sustainable redevelopment (modified)*

2. *At the Northwest Corner of the site and along the Northern Shoreline, excavation of surface soil (0- 12 inches) contains greater than 1ppm PCB and subsurface soil containing greater than 10 ppm PCB to a maximum depth of 9 feet. Outside of the Northwest Corner and the Northern Shoreline areas, excavation of surface soil (0-12 inches) containing greater than 1ppm PCB and subsurface soil contains greater than 10 ppm PCB, to a maximum depth of 12 feet. (modified)*

3. *Outfalls and associated pipe bedding from Building 52 that are potential PCB source areas will be excavated, sampled and removed, or decommissioned as approved by the Department. (new)*

4. *Excavation of shallow soils from the southern portion of the site that are identified as "lead hotspots". These correspond to lead levels between 2,160 ppm and 43,200 ppm. (unchanged)*

5. *In conjunction with OU2, installation of a sheet pile wall within the Hudson River to provide containment and allow for the recovery of PCB DNAPL onshore and offshore of the northwest corner of the site. The location and alignment of the proposed sheet pile wall will be verified during the remedial design to minimize filling into the Hudson River. The area behind the sheet pile wall will be filled with soil and/or lightweight aggregate as approved by the Department. The sheet pile wall will include sealed joints, installation of tie-rods, upland anchors, and cathodic protection. The wall system will also include groundwater filtration units to adsorb contaminants that may be present in groundwater discharging to the river. (new)*

6. *The shoreline south of the northwest area will either be a steel bulkhead or construction of a sloped shoreline cover system. The sloped shoreline cover system will be designed and constructed such that no additional fill material will be placed into the Hudson River, and will require the removal of sediment or fill below the current sediment or water elevation for placement of a cover system. The sloped shoreline cover system will be designed with the following layers: an isolation layer of soil or geotextile designed to prevent the migration of contaminated soil particles into the Hudson River; an erosion protection layer; and a habitat/surface substrate layer. The habitat/surface substrate layer will be designed to restore aquatic, intertidal and stream bank habitats while taking into account erosional forces, such as waves and currents. (new)*

7. *Construction and operation of a recovery system for PCB DNAPL, consisting of a series of wells and an active pumping system to remove fluid PCB material as it collects. (new)*

8. *A site cover will be required to allow for restricted residential use of the site. The cover will consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). However, pile-*

supported structures will not be permitted in any areas where PCB material is potentially present. Where the soil cover is required, it will be a minimum of two feet of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for restricted residential use. The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer with appropriate natural species. (modified)"

The ROD also requires development of a Site Management Plan, including institutional controls, which will be implemented after construction.

1.6.2 OU-2

The 2012 ROD describes the elements of the OU-2 (off-shore) remedy as follows:

1. *A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Green remediation principals and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:*

    - *Considering the environmental impacts of treatment technologies and remedy stewardship over the Longterm;*
    - *Reducing direct and indirect greenhouse gas and other emissions;*
    - *Increasing energy efficiency and minimizing use of non-renewable energy;*
    - *Conserving and efficiently managing resources and materials;*
    - *Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;*
    - *Maximizing habitat value and creating habitat when possible;*
    - *Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and*
    - *Integrating the remedy with the end use where possible and encouraging green and sustainable re-development*

2. *Installation of a sheet pile wall within the Hudson River to provide containment and allow for the recovery of liquid PCB DNAPL offshore of the northwest corner of the site. The location and alignment of the northwest extension area (NEA) sheet pile wall will be verified during the remedial design to minimize filling into the Hudson River while enabling effective DNAPL containment and recovery and maintaining stability of the site. It is estimated that this area of fill will encompass 0.88 acres. The area behind the sheet pile wall will be filled with soil and/or lightweight aggregate as approved by the Department. The sheet pile wall will include sealed joints, installation of tie-rods, upland anchors, and cathodic protection. The wall system will also include groundwater*

filtration units to adsorb contaminants that may be present in groundwater before discharge to the river.

3. *Mitigation of fill placed into the Hudson River to replace the aquatic habitat that will be lost as a result of the NEA. Mitigation will involve the creation and/or restoration of river habitat in accordance with a Department-approved plan.*

4. *Development and implementation of a plan for further delineation and recovery of PCB DNAPL from beneath the northwest corner of the site and the NEA.*

5. *Removal of sediment and fill that contains PCB concentrations greater than 1 ppm and/or copper, zinc and lead concentrations above the background concentrations listed in Table 2 of Exhibit A, to a maximum excavation depth of 6 feet within the area where sediment resuspension controls, such as a fixed silt curtain, are feasible. This area generally corresponds to a water depth of 15 feet and a distance from the shoreline into the river of approximately 60 to 80 feet and along approximately 2000 feet of shoreline.*

6. *The specific area where fixed sediment resuspension controls can be feasibly deployed will be evaluated during design based on the water depth and velocity conditions at the site. Alternative designs for fixed resuspension controls will be evaluated to increase the depth of feasible resuspension controls. Designs for mobile resuspension controls will also be evaluated and developed for dredging in deeper water, if necessary.*

7. *Removal of sediment from a targeted area outside the northwest extension area in deeper than 15 feet of water that is defined by PCB concentrations greater than 50 ppm, to a maximum depth of 6 feet. During the design, sampling will be performed to determine whether additional areas of PCBs greater than 50 ppm exist. Based upon an evaluation of the significance of the distribution of contaminants and the feasibility of removal, additional areas of sediment may be targeted for dredging.*

8. *On-site dewatering of dredged and excavated sediments for off-site transportation and disposal or onsite reuse, as appropriate. On-site reuse of sediments will be evaluated during design. Water removed from the sediment will be treated and discharged back to the river in compliance with regulatory requirements.*

9. *Backfill of dredged areas with Department-approved material. Dredged areas within the resuspension controls will be backfilled with clean material to isolate remaining contamination, prevent erosion of cap materials, restore bathymetry, and provide a habitat layer. In nearshore areas which have contamination remaining above background concentrations, isolation capping will be placed following dredging. The isolation cap will consist of a sand isolation layer; armoring layer; and a minimum of a 24 inch habitat layer. The isolation and armoring layer thicknesses and materials of the cap will be established in the remedial design. As part of the design, a river flow and deposition study will be conducted to determine approximate sedimentation rates and the acceptability that up to 12 inches of the habitat layer may fill in by natural deposition within a reasonable duration of time after installation of the remainder of the isolation cap. Additional backfill needed to reach bathymetry requirements will be placed between the erosion protection layer and habitat layer. The habitat layer will be designed to restore aquatic habitat. Dredged areas that are outside the near shore area*

will be backfilled with appropriate river substrate to within 12 inches of the pre-dredge elevation provided that the sedimentation study demonstrates that sufficient deposition will occur within a reasonable time frame. All activities associated with the excavation and restoration of Hudson River sediments will meet the requirements of 6NYCRR Part 608."

The ROD also requires development of a Site Management Plan, including institutional controls, which will be implemented after construction.

2. PRE-DESIGN INVESTIGATION

Numerous prior investigations have collected data that will be used for design of the remedy. Specifically, environmental and geotechnical data from the following recent activities is relevant:

- 50% Design Report for Operable Unit No. 1, Haley & Aldrich of NY (2006)
- Supplemental Northwest Corner Investigation Findings Report", Haley & Aldrich of NY (2008)
- DNAPL IRM Recovery Well Installation", Haley & Aldrich of NY (2010).

However, data gaps remain that must be filled in order to complete the design. These data gaps include definition of excavation extents, definition of dredge extents, geotechnical data at select alignments and supplemental information regarding site features which will impact design and constructability (e.g. riprap, outfalls, former sumps, etc.)

This section describes the activities for collection of additional data required for the design of the remedy. The majority of the activities will be completed upon approval of this work plan, however, some specific activities have been completed under separate work plans.

The OU-2 ROD requires an updated bathymetry survey be completed as part of the baseline sampling for the Site Management Plan. This information is also required for planning the PDI, and was completed in accordance with a work plan approved by NYSDEC (letter dated 10 October 2012); results have been submitted to NYSDEC. Review of the results from the bathymetry survey indicates that none of the anomalies require additional probes or borings. See Appendix C for the bathymetry results submittal.

2.1 Phase 1 PDI Investigation

To better plan the PDI, some activities have been submitted and approved under the OU-1 ROD prior to this RDWP. The Phase 1 PDI Investigation (Phase 1) work plan is attached for reference as Appendix 1 and includes the following tasks.

- Ground Penetrating Radar (GPR) survey will be evaluated.

- Groundwater level data collection through the deployment of data loggers in select existing monitoring wells to support the update of the site-specific groundwater model.

- The Site survey will update site features and investigation locations and be completed in phases by a NYS licensed surveyor.

2.2 OU-1 Supplemental Investigation

Data collection in this section includes various topics or planning related information required for design (see Appendix 2).

2.2.1 Groundwater Levels

Design of the remedy requires collection of groundwater elevations and updating the existing groundwater model. In addition to the 16 data loggers installed in existing wells as part of the

Phase 1 PDI Investigation, seven (7) groundwater monitoring wells will be installed and data loggers deployed therein.

2.2.2 Groundwater Sampling

Baseline groundwater sampling will be completed to monitor shallow groundwater prior to remedial construction to evaluate the long term effectiveness of the remedy.

Baseline groundwater sampling will be completed for three site wells and three upgradient wells during the PDI and then annually thereafter until the beginning of construction. Groundwater samples will be collected using low flow techniques and analyzed for PCBs, beryllium, copper, lead, and zinc.

2.2.3 Void Assessment

There are several areas of the Site, especially in areas adjacent to the Hudson River, in which evidence of soil erosion or subsidence beneath the concrete slab (i.e. voids) have been observed. These areas will be assessed by using a hammer drill to access the subsurface and evaluating soil contact with the slab. Results of this evaluation will be used to support the remedial design.

2.2.4 Subsurface Anomalies

Additional investigation will be conducted for various sumps and subsurface anomalies identified previously as well as anomalies identified during the Phase 1 activities. This work may include a series of slab cores to identify and measure existing sumps or voids beneath existing slabs.

2.2.5 Outfall Investigations and Evaluate Existing Underground Utilities

During prior site activities, storm sewers and other utilities were discovered that are not currently well documented with respect to alignments, outfall locations, etc.

This investigation will use a combination of historical document review, direct visual observation (e.g. opening manholes), video observation of major sewer piping, probes and/or test pits and includes investigation of Building 52 outfalls.

2.3 OU-1 Excavation Pre-delineation

Excavation is the remedy selected to address onshore soils that exhibit concentrations of PCBs above removal criteria. The basis for excavation locations is historic data collected during the RI, 50% Design, and other Site activities, which are described in the Conceptual Site Model (CSM) (Haley & Aldrich, 2008). This data is not sufficient to delineate the extents of excavation required to meet the remedial action goals in the ROD. Since a significant portion of excavations may extend below the water table and will require shoring or other methods to support the excavation, determining the extents of PCB contamination during construction (i.e. complete initial excavation followed by sampling and analysis to confirm the extents (i.e., verification sampling and analysis)) is not efficient, may not be possible, and increases workers exposure to safety risks. Therefore, a pre-excavation delineation sampling program will be completed to fully define the required horizontal and vertical limits of removal prior to construction.

In general, existing data points that indicate the presence of PCBs that exceed removal criteria will be delineated in accordance with sampling frequency identified in DER-10 guidance. Between 200 and 250 locations ("offsets" from existing data points) will be completed and between 400 and 600 samples collected and held or analyzed during the first round of sampling, which includes resampling existing locations and offsets from existing data points. Additional sampling ("step outs" from first round "offsets") may be required based on results of the initial offsets from existing data points. Below is a summary of the program. Details of the program are described in Appendix 3.

PCBs are present at concentrations that exceed removal criteria beneath Building 52 as identified in the CSM but sampling is not included in this RDWP due to the uncertainty regarding the remedy implementation in this area. If sampling within Building 52 is determined to be required, the RDWP will be amended or a separate workplan submitted.

2.3.1 Spatial Distribution of Samples

The excavation pre-delineation program investigates an existing exceedance through sampling at an offset that satisfies the minimum sampling requirements set forth in DER-10 guidance (i.e. one sample per 30 linear feet of sidewall, one sample per 900 square feet of excavation bottom, and horizon samples where applicable). Offset distances and geometries from existing data points will vary based on subsurface features present in the vicinity of existing data points. Design of excavation pre-delineation sampling will vary depending upon the location of existing borings with respect to subsurface features and other data points. Evaluation of locations that exceed criteria will generally fall into one of three categories as described below.

1. An "isolated" existing data point describes an existing data point location in which no other data or subsurface features, which exhibits the potential to be a source of PCBs, exist in the vicinity. These areas will generally be investigated as a 30 foot by 30 foot investigation unit unless supplemental site or chemical information indicates that reducing the area is appropriate.
2. A "linear feature" is one or more data points with a criteria exceedance that may be associated with a utility or other liquid conveying site feature (e.g. outfalls and associated pipe bedding from Building 52 that are potential PCB source areas). Criteria exceedances associated with these features may be related to the gravel bedding parallel to the feature and result in horizontal distribution of impacts in the direction parallel to the feature more than in the directions perpendicular to the feature. Therefore, the approach for pre-delineating excavation limits will be to position offsets closer in the direction perpendicular to the feature (e.g. 5 feet) and the standard sampling interval (i.e. 30 feet) in the direction parallel to the feature. Presence of supplemental site or chemical information may indicate that reducing the offset distance is appropriate.
3. A "cluster" location refers to an area where multiple existing data points with criteria exceedances exist within close proximity to one another in an area greater than 900 square feet. For this case, the initial geometry of the investigation units is defined based on the existing data and offset samples are placed around the perimeter. Within a "cluster" one data point may serve as a confirmation sample for the side wall of an adjacent area.

2.3.2 Vertical Distribution of Samples

Similar to the horizontal pre-delineation, the vertical (bottom) extents of PCB criteria exceedances within each excavation area will be established through pre-excavation sampling and analysis. Sampling depths intervals will be determined relative to existing grade.

Determination of excavation limits requires sidewall and bottom samples that exhibit concentrations of PCBs below exceedance criteria as follows:

- Bottom samples will be collected as required. Note that the initial excavation depth will be established as the top of the clean sampling interval (e.g. if the existing data point (or resample) indicates the presence of PCBs below criteria at a depth of 8 – 10 feet and above criteria at 6 – 8 feet, then the excavation bottom would be established at 8 feet).
- Bottom of sidewall samples will be collected from borings at the bottom two foot interval of the proposed excavation.
- Horizon samples will be collected, if applicable, at sidewalls (i.e. offsets and step outs) where multiple horizons of exceedances are identified in the existing sample location:

    - At intervals of elevated concentrations which are separated by an interval with significantly lower concentrations.

Vertical sampling intervals will be:

- 0-2 ft for lead hotspots
- Two foot intervals for bottom of excavation samples
- Horizon samples, if applicable, will be collected at the 2 foot interval that corresponds with interval of elevated concentration identified in the existing data point.

Sample interval depths have been identified to define maximum excavation depths as follows:

- 9 feet bgs in the Northern Shoreline Area
- In other areas of the site where PCB impacts above criteria extend below 12 feet, excavation pre-delineation sampling may be proposed to stop at 9 feet. The DEC will be consulted in these specific areas prior to altering the sampling program.

Lead hotspot locations have a pre-determined excavation depth of 2 ft. Therefore, offset borings will only be completed to determine the horizontal distribution of subsurface impacts as specified in the ROD.

If exceedances occur after multiple step-out attempts, alternate methods to delineate PCB criteria exceedances may be reviewed with NYSDEC.

2.4 Extension Alignment Investigation

The selected remedy includes a bulkhead that extends into the Hudson River in the Northwest Offshore Area (See Appendix C) which requires confirmation of the absence of PCB Material as DNAPL or semi-solid phase and obstructions along the alignment of the proposed bulkhead (see Appendix 4). The probes will also confirm the absence of obstructions (e.g. riprap).

In general, the probes will ascertain presence or absence using a barge mounted drill rig. Where possible (along the northern property line) the probes will be advanced from land based equipment. Off-shore probes will be advanced using rotary wash drilling techniques, using a drilling rig mounted on a Shugart barge. Casing will be advanced through the sediment and split spoon samples will also be advanced in front of the casing. Samples will be examined for PCBM as discussed in the preceding section. If no recovery is obtained, observations will be made to evaluate whether PCBM is visibly adhered to the split spoon sampler. The split spoons will be advanced either to the top of the Marine Silt, or until hammer blow counts indicate the potential presence of riprap.

2.4.1 Purpose and Scope

The purpose of the PCBM and riprap probes is to evaluate the presence of both PCBM and obstructions along the alignments of the proposed bulkhead extension wall and deadman. It is important to confirm that semi-solid or liquid PCBM do not exist along the alignment, since it could be dragged down to the Basal Sand aquifer during construction of the wall.

A phased approach of probes is planned in the vicinity of the planned extension wall and deadman, with the actual number and locations of probes to be determined as the work progresses, depending on conditions encountered. The proposed probe procedure utilizes methods that have been successfully employed at the site during previous investigations, which include the adhesion testing performed in 2008 to observe presence of PCBM, and the riprap probes performed in 2010 to initially evaluate the extent and thickness of riprap.

In general, samples will be obtained from the probes and will be evaluated to determine visual evidence of PCBM. A procedure to visually observe PCBM in sediment samples, called adhesion testing, was previously performed at the site in 2008. Samples will be visually inspected, probed with a stainless steel spatula, and logged for PCBM observations and soil stratigraphy. Samples where PCBM is positively identified will be photographically recorded.

2.4.2 Off-shore Probes

Off-shore probes will be advanced using rotary wash drilling techniques, using a drilling rig mounted on a barge. If assumed riprap is encountered, the rollerbit will be inserted into the hole and spun to confirm refusal. Observations will be made of the thickness and likely size of the riprap (as inferred based on drilling action).

Split spoon samples will be obtained from mudline to 5 feet below the top of the Marine Silt (except for the obstruction zones or in locations where roller bit refusal is encountered

The general sequence of the work is anticipated to be as follows:

- Round 1 - Perform probes generally at 30-foot centers. At locations adjacent to an existing positive PCBM observation, the probe spacing will be decreased to 15 feet. For each probe, obtain split-spoon samples at 2-foot intervals to a depth corresponding to 5 feet below the estimated top of the Marine Silt. Perform adhesion testing on each split spoon sample. If obstructions are encountered when pushing the split spoon, the roller bit will be advanced through the obstruction to the extent possible, to obtain information on thickness and size of riprap. If no PCBM is observed in any sample taken from Round 1, and if no significant riprap thickness is encountered, the program will be complete. For locations where PCBM is observed in Round 1 samples, and/or if significant riprap thickness is encountered, continue to Round 2 at those locations.

- Round 2 and 3 – Perform probes 13 feet outboard from previous round in locations where positive PCBM observations are identified, and/or riprap is encountered. Spacing of probes will be determined based on conditions encountered in the previous round. If no PCBM is observed and no riprap is encountered, the program will be complete.

Up to approximately 27 probes are expected to be completed for Round 1. Locations adjacent to the Old Marina are approximate and subject to change based on access restrictions for the drilling barge.

2.4.3 Probes Along North Property Line

The purpose of the probes planned to be drilled adjacent to the north property line is to determine presence or absence of PCBM and riprap, as discussed above, with the added objective of determining whether the wall alignment can be moved south to coincide with the property line along the Old Marina. The current alignment shown in the RFS is north of the property line.

Due to the sloped shoreline and tidal conditions, a drill rig cannot physically be positioned to install vertical borings at the property line. Therefore, the drill rig will be positioned on-shore as near as possible to the property line, and an angled boring will be completed to evaluate conditions at the property line.

Most of the property line probes will be spaced 15 to 30 feet apart.

Probes will also be performed along the Round 2 and/or Round 3 lines, as needed, if the Round 1 probes indicate the presence of PCB Material, or significant obstructions. The actual number of locations will vary based on actual results since the observations may indicate the need to “step-out” from some locations.

2.5 Deepwater Investigation

The goal of this investigation is to examine deepwater areas where PCBs in excess of 50 mg/kg (ppm) (elevated PCB concentrations) are known or suspected to be present in order to gather data for making decisions regarding remedial action (see Appendix 5). This investigation addresses areas in the proximity of existing exceedances and areas between EB-10 and EB-14. Areas previously identified in the ROD to be dredged are pre-delineated in a separate investigation (see Appendix 6). The deepwater investigation sediment sampling, which will be conducted within an area located approximately 300 feet off-shore of the Site (approximately 4 acres), will be used to further understand lateral and vertical PCB contamination, within specific deepwater areas.

The sampling program employs a 160-foot triangulation grid for investigation areas and an 80-foot triangulation grid for refinement of extents of contamination. All tasks will be performed during a single field event to the extent feasible. As currently planned, the sampling vessel will remain on site until all locations are completed. Sampling described in Task 1, Task 2 and some of the Task 3 locations associated with historical locations (EB-10, EB-14, CS-19) will all be completed during the first sampling round (26 locations). After analysis and review with the NYSDEC, additional Task 3 samples may be completed (up to 22 or more locations). Task 4 sampling may also be completed as described herein.

- **Task 1: Resampling - Resample Specific Locations With Elevated PCB Concentrations**
  This task investigates areas in the proximity of specific existing exceedances. Specifically, this task will re-sample areas proximate to three previously sampled deepwater locations where elevated PCB concentrations were detected (EB-10, EB-14, CS-19). Sampling at these locations will be used to 1) confirm the presence of elevated PCB concentrations at each location, 2) confirm the depths of elevated PCB concentration previously detected, and 3) observe physical characteristics at each location.

- **Task 2: Investigation Unit Sampling - Sample the Area Between EB-10 and EB-14**
  This task samples areas between EB-10 and EB-14. Sampling at these locations will be used to 1) identify the presence of elevated PCB concentrations at each location, 2) to identify the depths of elevated PCB concentration if present, 3) determine whether additional sampling (i.e. step-out sampling) is necessary, and 4) observe physical characteristics at each location. Sediment samples will be collected in a 160-foot triangulation grid pattern to divide the investigation area into hexagonal Investigation Units.

- **Task 3: Decision Unit Sampling - Including Step-out Investigation (as needed)**
  Investigation Unit(s) will be divided into smaller hexagonal Decision Units as necessary. Sampling will include locations associated with Task 1 and locations from Task 2 that require additional investigation. Finally, step-out samples will be collected in areas that require additional investigation and would create new Decision Units. This investigation task will further assess the nature and extent of elevated PCB concentrations emerging from Task 2 and will support decisions regarding the need for remedial action.

- **Task 4: Variability of Sediment Concentrations**
  Based on a review of data collected in Tasks 1-3, additional samples may be propose to assess the variability of the sediment concentrations to better understand if the concentrations are uniform or if exceedances are sporadic. Based on the results from the initial sampling, locations may be selected to help assess the contaminant mass distribution in relevant areas. Three additional cores would be added in close proximity to the location being evaluated, with samples collected at corresponding intervals.

2.6 Off-shore Pre-delineation

Appendix 6 describes a program to provide supplementary data for making decisions regarding remedial action. The existing data collected during the RI and other Site activities was sufficient for completion of the feasibility study but additional data is necessary for further delineation of areas for potential remedial action and to pre-delineate the extent of dredging required in the ROD, especially in the areas referred to in the RFS as backwater areas consisting of the South Boat Slip, North Boat Slip and the Old Marina. Investigation will be completed in Nearshore areas, Backwater areas and the Deepwater area adjacent to the Northwest Offshore Area.

Vibracore samples along with ponar grabs for surface samples will be collected from barge or boat-mounted equipment. Re-sampling may also be conducted at some previously sampled locations confirming existing data where elevated PCB and metals concentrations were detected.

Vertical distribution of sample intervals will be used to delineate PCB and metal concentrations in targeted sediment deposits which may require dredging and to document the sediment concentrations that will be left in place after remedial action. An initial 0-0.5 ft. depth interval will be sampled to correspond to previous depths and analyses along with a 0.5-1 ft. interval. One-foot sampling depth intervals will be conducted up to 7 ft. depths to provide more refined PCB and metals contaminant distribution data and residual concentrations.

Spatial distribution was selected based on the following and considered the presence of existing data. The sampling program employs a sampling grid in order to fill data gaps or address uneven distribution of existing data. Grid spacing is approximately 80 feet and will provide a consistent basis for understanding the distribution of contaminants in the sediment to refine dredge extents and provide a basis for remedial design. Additionally, step-out sampling will be implemented where required to adequately delineate locations where spatial extents are not fully bounded.

2.7 Geotechnical Exploration

Geotechnical conditions and analyses are critical for design of the remedy. Collection of several types of data is described in Appendix 7.

Several phases of geotechnical investigations have been performed at the site in the past, and are shown on Figures 2A and 2B in Appendix C, Existing Geotechnical Explorations. The following is a general summary of the existing geotechnical information:

- 20 borings that terminated in the Marine Silt
- 49 borings that terminated in the Basal Sand (20 in the river, 29 on land)
- 14 borings that terminated in Rock (all on land)
- 10 test pits
- Geotechnical laboratory test data
  - Strength testing (unconsolidated undrained [UU] triaxial, consolidated undrained [CU] triaxial, direct simple shear [DSS], and field vane)
  - Consolidation testing
  - Index testing (Atterberg Limits, organic content, grain size, specific gravity)

Some data gaps have been identified, and new geotechnical explorations are proposed to address the data gaps and provide additional stratigraphy and laboratory testing data in several areas: in the general vicinity of the planned deadman anchor, in the general vicinity of the planned Northwest Extension bulkhead wall, and in the off-shore area between the North Boat Slip and the South Boat Slip. The information will be used for bulkhead and deadman design, excavation support design, design of the sloped shore, and general site geotechnical analysis (e.g., settlement).

Additionally, some test pits are planned at various locations around the site where sheetpile support of excavation (SOE) may be used during remedial construction (i.e., excavation locations that are about 6 feet bgs or greater). The purpose of the test pits is to gather information on soil conditions, excavation effort, existing foundations and potential obstructions that could affect the design and/or construction of the sheetpile SOE walls.

2.8 Bench Testing

Design of the site remedy may include management of saturated soils and sediment, treatment of water during construction and long-term treatment of groundwater as part of a groundwater management system. Prior to remedial design at the Site, a series of bench-scale treatability tests will be performed to identify effective treatment technologies and associated design parameters for the potential full scale system (see Appendix 8). These technologies include:

- Solids Dewatering: Methods and basic design parameters for the dewatering of water-laden excavated soils and dredged sediments;
- Stabilization: Methods and basic design parameters for the solidification of construction materials to be re-used on-site for various purposes, which may include structural fill;
- Construction Water Treatment: Methods and basic design parameters for the potential treatment of various metals and PCBs in water generated during construction activities (e.g., solids dewatering supernatant and on-shore excavation dewatering); and
- Long-Term Groundwater Treatment: Initial testing of treatment methods for residual groundwater: to screen technology and provide basic design parameters for further testing, if needed.

2.9 Pilot Tests

No pilot tests are currently planned for the Pre-Design Investigation. If pilot testing requirements are identified, a workplan will be submitted separately.

2.10 Field Procedures

Field procedures are provided in Appendix A. Procedures specific to various PDI tasks are referenced within the appendix that describes that task. Some procedures that are common to multiple tasks are summarized below. Subcontractors selected for individual PDI tasks will submit proprietary Standard Operating Procedures that will be reviewed and inserted into Appendix A prior to the commencement of work.

Decontamination

Where applicable, reusable equipment will be decontaminated prior to each use, and following each work day, if they are used, in order to prevent cross-contamination. An onshore area will be designated for decontamination of equipment used in the field investigations.

Investigation Derived Waste Management

All remaining sediment, fluids used for decontamination of sampling equipment, and sample collection disposable wastes (e.g., gloves, paper towels, foil, etc.) will be placed into appropriate containers and staged on-Site for disposal. These Investigation Derived Wastes (IDW) will be disposed in accordance with the project guidelines.

In some areas within the Site it may be acceptable to return exploration soil cuttings and test pit soils to the point of collection. In other areas it may not be practical to return cuttings and soils to their origin, and they will be better handled by collection, followed by characterization and disposal. Prior to returning IDW to the point of collection (e.g. test pits), visual observations will be made to determine the presence of DNAPL, LNAPL, or obvious signs of semi-solid PCBM. In the absence of these observations, IDW will be returned to point of generation. If these types of material are observed, then NYSDEC will be consulted and spoils will be characterized and disposed.

2.11 QAPP

The Quality Assurance Project Plan (QAPP) is bound herein as Appendix A. The QAPP has been developed in accordance with the EPA guidance documents; "EPA Requirements for Quality Assurance Project Plans", EPA QA/R-5, March 2001; "EPA Guidance for Quality Assurance Project Plans"; EPA QA/G-5, February 1998, and the "EPA-New England Quality Assurance Project Plan Guidance", April 2005.

2.12 PDI Data Summary Report

Following completion of PDI field work and laboratory analyses, a PDI Data Summary Report will be prepared and submitted to NYSDEC. The report will include:

- Site Management (H&S, CAMP results, waste management)
- A description of activities (soil sampling, sediment sampling, probes, geotechnical borings, test pits, bench tests)
- Figures depicting the surveyed location of activities
- Boring logs
- Analytical and geotechnical data tables
- Data validation summary

3. BASELINE MONITORING

Several types of "baseline" data are required for specific monitoring requirements. The main goal for the baseline sampling is to provide a benchmark against which post-construction performance monitoring can be compared in order to assess the performance and effectiveness of the remedy. This section summarizes those requirements and the work plans to comply with those requirements. Note that noise reference data will be collected prior to commencement of construction and the data collection will be described in the RAMP.).

3.1 OU-2 Baseline Sampling and Analysis Plan (BSAP)

The OU-2 ROD requires baseline sampling of OU-2 media and biota as part of the Site Management Plan, which will be submitted following the remedial action. In order to acquire baseline data, sampling is required prior to construction. The OU-2 Baseline Sampling and Analysis Plan has been submitted to NYSDEC under a separate cover.

3.2 Groundwater Sampling

Baseline sampling of site groundwater was requested in a letter from NYSDEC dated 5 April 2013. Existing monitoring wells will be resampled during this PDI to update site groundwater data, as described in Appendix 2.

3.3 PCB Air Monitoring

Baseline sampling or background concentrations of PCBs in air will be collected at the site prior to commencement of construction activities and will be described in detail in the construction phase CAMP under separate cover.

4. REMEDIAL DESIGN

4.1 Technologies

The site remedy technologies consist of excavation, backfill, a bulkhead, site cover, groundwater treatment, potential DNAPL recovery and dredging. None of these technologies are innovative or unproven.

The design will also incorporate the proposed mitigation for the encroachment into the river of the new extension bulkhead. Selection of the mitigation scope will be completed after completion of the preliminary design of the bulkhead and the extent of encroachment; if any, has been defined.

4.2 Design Phases

The design will be prepared in two phases: Preliminary and Final. By taking this approach a Remedial Action Work Plan (RAWP) will not be prepared. The design will be based on data from the PDI as well as other prior investigations.

<u>Preliminary Design</u>

Preliminary Design will include calculations for excavation, backfill, site cover, drainage, shoreline design, bulkhead, corrosion protection, shoring, dredging and groundwater treatment. Preliminary studies will be made to assess turbidity control methods, transportation methods for materials onto and off the Site, disposal location(s), source(s) of backfill, fill material sources (both upland and river), river hydrodynamics and the site groundwater model.

A specific analysis will be made in consultation with NYSDEC to develop a mitigation plan for the encroachment into the river that will result from installation of the new extension bulkhead. The extent of the potential encroachment will be determined during the Preliminary Design. The mitigation will be developed and integrated into the overall design.

During preliminary design, scaled drawings will be prepared and will include the following design elements:

- Site General Arrangement
- Bulkhead
- Excavation extent
- Dredging extent
- Rough Grading
- Finish Grading
- Groundwater Treatment
- Utilities
- River Encroachment Mitigation

The Preliminary Design will also include:

- Update to the groundwater model
- Hydrodynamic analysis

- Sea level rise analysis
- Temporary facilities for construction support
- Materials delivery and transport facilities
- Record of permit status
- Updated cost estimate
- Updated project schedule
- List of specifications

The remedial design will consider additional factors including:

- Sustainability. The design will evaluate core elements including:

  i. energy requirements;
  ii. air emissions;
  iii. water requirements and associated impacts on water resources;
  iv. impacts on land and ecosystems;
  v. material consumption and waste generation; and
  vi. impacts on long-term stewardship.

- Protection of identified fish and wildlife resources. The remedial design will include appropriate measures for delineating and protecting the identified resource or habitat and for monitoring related impacts during the implementation of the remedial action.

At the conclusion of Preliminary Design, a Preliminary Design Submittal will be prepared for review by NYSDEC.

Final Design

Final Design will incorporate any comments resulting from review of the Preliminary Design. Drawings, work plans and technical specifications will be included of sufficient detail suitable to bid the work and for the selected Contractor to execute the work. A cost estimate for the remedial action will also be prepared.

At the conclusion of Final Design, a Final Design Submittal will be prepared for review by NYSDEC. The Final Design will be signed and stamped by a NYS PE and include the required certifications.

4.3 Work Plans and Monitoring Plans

As part of the design process, various plans will be prepared to support the remedial action and submitted with the Final Design.

4.3.1 Remedial Action Monitoring Plan (RAMP)

The remedial action monitoring plan (RAMP) which details the monitoring needs during construction includes:

- the frequency of sampling or monitoring;
- the specific steps involved;

- an applicable quality assurance/quality control plan; and
- reporting.

4.3.2 Community and Environmental Response Plan (CERP)

The community and environmental response plan (CERP) is a concise summary of the controls, monitoring or work practices and how they combine to provide the necessary protection of the community and ecological resources, the details of how these are to be implemented will be included in the technical specifications of the design. In particular, this plan addresses short term impacts and includes:

- a summary of the CAMP (see below);
- identification of any temporary measures to be erected or installed to protect the public on or adjacent to the site from exposure;
- vapor/odor management plans;
- noise and vibration baseline monitoring and mitigation;
- measures to secure the site from trespassers;
- erosion and sediment control measures to comply with the substantive requirements of a storm water management permit;
- waste management measures;
- water management and treatment measures;
- traffic control and site access plans;
- decontamination of trucks and equipment leaving the site; and
- off-site trucking routes and emergency procedures.

4.3.3 Community Air Monitoring Plan (construction phase)

The CAMP will address community health and safety, which identifies measures or actions to ensure that the public living and working near the site as well as employees or visitors to any facility located on the site are protected from exposure to site contaminants during intrusive activities and remedial actions. The CAMP will include:

- Requirements identified by the NYSDOH (DER-10 Appendix 1A).
- Baseline sampling for dust and noise
- A fugitive dust/particulate monitoring program (DER-10 Appendix 1B).
- A noise monitoring program

5. PERMITS OR AUTHORIZATIONS

The remedial action will be designed to comply with applicable federal, state and local laws, regulations and requirements. Permits or other authorizations necessary to implement the remedial program, or for which the permit exemption provision of DER-10, Section 1.10 apply, will be identified in the Preliminary Design and Final Design along with any information necessary for demonstrating compliance with the substantive permit or other authorization requirements.

Permits (or authorizations) currently identified for consideration during the design are:

1. JPA. A Joint Permit Application (JPA) will be made that addresses requirements of USACE, National Marine Fisheries and NYS Department of State. Initial discussions will commence following approval of this RDWP.

2. SPDES or POTW - Construction dewatering effluent will be discharged either to the Hudson River or to the POTW. Once the discharge is determined during Preliminary Design, the appropriate submittals will be initiated.

3. Resources. The substantive technical requirements of applicable resource-related permits (e.g., 6 NYCRR Parts 608, 661, 663) will be identified and appropriate submittals will be initiated.

4. Permit Exemptions. Exemptions from the following permit programs will be reviewed as described in DER-10, Section 5.1(c)(6):

    - Air - Title 5 permits
    - Air - State permits
    - Air - Registrations
    - Ballast Discharge
    - Chemical Control
    - Coastal Erosion Hazard Areas
    - Construction of Hazardous Waste Management Facilities
    - Construction of Solid Waste Management Facilities
    - Dams
    - Excavation and Fill in Navigable Waters (Article 15)
    - Flood Hazard Area Development
    - Freshwater Wetland
    - Hazardous Waste
    - Long Island Wells
    - Mined Land Reclamation
    - Navigation Law - Docks
    - Navigation Law - Floating Objects
    - Navigation Law - Marinas
    - Non-Industrial Waste Transport
    - Operation of Solid Waste Management Facilities
    - Operation of Hazardous Waste Management Facilities
    - State Pollution Discharge Elimination Systems (SPDES)
    - Stream Disturbance
    - Tidal Wetlands

- Water Quality Certification
- Water Supply
- Wild, Scenic and Recreational Rivers

5. TSCA. USEPA will be consulted with respect to the Toxic Substances Control Act. Revision to the RDWP may be required based on that consultation.

6. SCHEDULE

The anticipated schedule is:

- Complete Pre-Design Investigation 270 days following approval of the RDWP.
- Submit a Data Summary Report 120 days following completion of the PDI.
- Submit the Preliminary Design 180 days following submittal of the Data Summary Report.

The schedule for Final Design, procurement of contractors and construction will depend on the timing and results of the review process. The schedule will be updated as necessary.

7. POST CONSTRUCTION PLANS

It is anticipated that institutional controls and environmental easements will be required as part of the remedy. Preparation of a draft Site Management Plan (SMP) will be initiated following receipt of comments on the Preliminary Design and completed during the construction phase. The SMP requires approval by NYSDEC before submittal of the final report. The SMP will be prepared in accordance with DER-10 Section 6.2 and include an updated site survey.

The SMP will provide a general description of the site, the controls in-place as well as a description of the nature and extent of the remaining contamination at the site. The SMP will include three separate plans summarized as follows:

i. institutional and engineering control (IEC) plan,
ii. monitoring plan, and
iii. operation and maintenance plan.

8. SITE FIGURES

DER-10 requires a scaled site map identifying all areas where remedial actions will be conducted, which specify, as appropriate or identified at this point in the project, the following:

i. the proposed location of remedial treatment units;
ii. the areas, with volumes if applicable, for each environmental medium to be remediated;
iii. the vertical and horizontal extent of area to be remediated;
iv. the location, depth and concentration of all contaminants in excess of the remedial action objectives;
v. sample locations, depths and parameters for all confirmation and/or documentation samples; and
vi. wetlands, streams or other habitats potentially disturbed by the remedial action.

The activities conducted as part of the PDI will further refine the understanding of the scope of the remedy. As indicated in DER-10 Section 5.2, scaled site maps are provided in this RDWP for investigations that will more completely identify areas where remedial actions will be conducted.

The current understanding of the scope of the remedy is shown in the figures listed below and are bound herein in Appendix C. These maps have been previously presented as Figures in two documents: the RFS and the OU-2 ROD.

SITE FEATURE	FIGURE
Project location	OU-2 ROD Figure 1
Site plan showing names of the geographic areas of the site	OU-2 ROD Figure 2
Selected Remedy – Modified Alternative 6	OU-2 ROD Figure 7
Selected Remedy – Section 8100	RFS Figure 18
Selected Remedy – Section 6780	RFS Figure 21
Selected Remedy – OU-1 Excavation Plan	RFS Figure 32
Location, depth and concentration of contamination in the Northwest On-Shore and Off-Shore Areas	RFS Figures 4, 5, and 6
Location, depth and concentration of contamination in OU-1 outside the Northwest Areas are represented by the designated areas of excavation on RFS Figure 32.	RFS Figure 32
Location, depth and concentration of OU-2 contamination	OU-2 ROD Figures 5 and 6

Proposed pre-delineation samples are described in Appendices 2 and 3 and will be completed in lieu of documentation and confirmation sample locations where applicable as well as further delineate the location, depth and concentration of all contaminants in excess of the remedial action objectives.

Regarding habitat types, the on-shore portion of the site is a closed industrial facility with the surface cover comprised primarily of concrete, asphalt, gravel, and structures. There are no wetlands on the site. The Hudson River habitat will be disturbed during remediation as shown in the figures and described above with mitigation developed during design.

As part of ongoing investigation and design-related activities, an updated map of Hudson River bathymetry has been prepared based on the Hastings Hydrographic Survey Work Plan and is contained in Appendix C.

APPENDIX A

Quality Assurance Project Plan (QAPP)

ATTACHMENT A
REMEDIAL DESIGN WORK PLAN
QUALITY ASSURANCE PROJECT PLAN

Prepared By:

HALEY & ALDRICH

Haley & Aldrich of New York.
200 Town Centre Drive
Rochester, New York 14623

14 October 2013

QUALITY ASSURANCE PROJECT PLAN

APPROVALS

Approved By: ________________________________ Date: ________________
Remedial Design Contractor – Haley & Aldrich, Inc.

Approved By: ________________________________ Date: ________________
Quality Assurance (QA) Officer – Haley & Aldrich, Inc.

Approved By: ________________________________ Date: ________________
Laboratory QA Officer – Pace Analytical, Inc.

Approved By: ________________________________ Date: ________________
Laboratory QA Officer – Terrasense Geotechnical Laboratories

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Preparer's Name and Affiliation: Denis Conley, Haley & Aldrich of New York

Preparer's Address: 200 Town Centre Drive Suite 200, Rochester, New York, 14618

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Remedial Design Contractor's Project QA Officer ____
Signature Date

____
Printed Name/Organization

Approval Signature ____
Signature Date

____
Printed Name Organization

Other Approval Signature ____
Signature Date

____
Printed Name Organization

LIST OF ACRONYMS AND SHORT FORMS

Acronym	Agency/Organization/Definition
CD	Consent Decree
COC	Contaminants of Concern (COC)
CRADA	Cooperative Research and Development Agreement
DO	Dissolved Oxygen
DQO	Data Quality Objective
DUSR	Data Usability Summary Report
EPA	United States Environmental Protection Agency
FSP	Field Sampling Plan
GAC	Granulated Activated Charcoal
GC/MS	Gas Chromatography/Mass Spectroscopy
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
ICP	Inductively Coupled Plasma
ICS	Interference Check Samples
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
MD	Matrix Duplicate
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NIST	National Institute of Standards and Technology
NYSDEC	New York State Department of Environmental Conservation
ORP	Oxidation-Reduction Potential
OVA	Organic Vapor Analyzer
PARCCS	Precision, Accuracy, Representativeness, Comparability, Completeness, Sensitivity
PDI	Pre-Design Investigation
PE	Performance Evaluation
PID	Photo-ionization Detector
PPE	Personal Protective Equipment
QA	Quality Assurance
QAO	Quality Assurance Officer
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control

LIST OF ACRONYMS AND SHORT FORMS (continued)

Acronym	Agency/Organization/Definition
RAO	Response Action Objectives
RD/RA	Remedial Design/Remedial Action
RDWP	Remedial Design Work Plan
RI	Remedial Investigation
ROD	Record of Decision
RPD	Relative Percent Difference
RPM	Remedial Project Manager
SDG	Sample Delivery Groups (SDG)
SOPs	Standard Operating Procedures
SOW	Statement of Work
SPT	Standard Penetration Test
SRM	Standard Reference Materials
SSO	Site Health and Safety Officer
SVOC	Semi-volatile Organic Compounds
SW-846	"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd Edition with Updates I through III

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been developed in accordance with the EPA guidance documents; "EPA Requirements for Quality Assurance Project Plans", EPA QA/R-5, March 2001; "EPA Guidance for Quality Assurance Project Plans"; EPA QA/G-5, February 1998, and the "Technical Guidance for Site Investigation and Remediation", (DER-10), NYSDEC, May 2010.

To accomplish the remedial design and implement the remedial design and remedial action (RD/RA) at the Former Anaconda Cable and Wire Co. Site, a series of Pre-Design Investigations (PDI) (see Figure 1.1) will be conducted to collect data to develop the design for appropriate remedial actions to address the site conditions identified during the Remedial Investigation (RI), evaluated during the Feasibility Study (FS) and selected in the Record of Decision (ROD).

The collection of the design data will utilize a variety of intrusive techniques for the sampling and analysis of soils, sediment, and groundwater.

These techniques will include:

- Discreet sampling of soil
- Discreet sampling sediments
- Discreet sampling of groundwater
- Collection of soils and groundwater from existing and new monitoring well locations,
- Collection of surface water processed during pilot/treatability bench testing activities
- Off-site analysis of Contaminants of Concern (COC) and associated parameters in accordance with procedures promulgated by the EPA Office of Solid Waste and Emergency Response in "Test Methods for Evaluating Solid Waste", SW-846, 1996
- Off-site analysis of sediment and surface soil samples for geotechnical characteristics in accordance with industry accepted procedures

2.0 PROJECT ORGANIZATION

2.1 Project Team Organization

The project team consists of a NYSDEC Remedial Project Manager (RPM), Remedial Design Contractor Project Manager, Quality Assurance Officer (QAO), Laboratory QAO, Data Validation Staff, Site Health and Safety Officer (SSO), and task leaders and field personnel. An additional component of the project team includes the analytical laboratories supporting the RD/RA project; laboratory responsibilities including Laboratory QAO, are described in Section 2.3.

Personnel responsibilities specifically related to QAPP activities are listed below. Resumes for key project personnel are provided in Appendix 4.

2.1.1 Haley & Aldrich - QAO

The Quality Assurance Officer is responsible for overseeing the review of field and laboratory produced data through the following functions:

- Assuring the application and effectiveness of the QAPP by the project staff
- Conducting internal quality checks of the PDI activities
- Providing input to the Project Manager as to corrective actions required resulting from the above-mentioned evaluations

2.1.1.1 Data Validation Staff

The Haley & Aldrich QAO will be assisted by the Data Validation subcontractor staff in the evaluation and validation of field and laboratory generated data. The QAO and Data Validation subcontractor staff will monitor the activities of the contract laboratories to meet the Data Quality Objectives (DQO) for the project. The data validator staff will be professionals independent of the laboratory and familiar with the analytical procedures performed. Resumes of the Data Validation staff are provided in the Attachment 4 of this document.

Data validation will utilize the EPA "National Functional Guidelines for Organic Data Review," US EPA 2008, the "National Functional Guidelines for Inorganic Data Review," revised 7/02, and the EPA Region 2 Data Validation Standard Operating Procedures (SOPs). The validation process will include a review of each validation criterion as prescribed by the guidelines and will be presented in a Data Usability Summary Report (DUSR) for each analytical data package.

2.1.2 Haley & Aldrich SSO

The Haley & Aldrich Site Health and Safety Officer is responsible for production, implementation, and enforcement of the Health and Safety Plan in accordance with safety rules and regulations.

2.2 PDI Organization

A total of seven (7) discrete PDIs are planned in support of the project as described in the RDWP. The Project Manager or the designated Task Leader is responsible for the execution of the respective PDIs. Depending on the task, appropriately experienced personnel will be assigned as field team leaders.

The field team leader is responsible for the overall operation of the field team in the completion of data collection activities in support of the PDI. The field team leader will work with the SSO to conduct the PDI activities in compliance with the Site Health & Safety Plan (HASP). The field team leader will facilitate communication and coordinate efforts between the Project Manager or his designee and the field team members.

Field Team Personnel involved in investigations and operations are responsible for:

- Performance of field activities as detailed in the RDWP and in compliance with the DQOs outlined in this QAPP,

- Taking all reasonable precautions to prevent injury to themselves and to their fellow employees and immediately reporting any accidents and/or unsafe conditions to the SS.

2.3 Laboratory Responsibilities

Several laboratory organizations have been selected to support the PDIs. These laboratory organizations include:

- Pace Analytical Inc. –Schenectady, New York

- Terrasense Geotechnical Laboratories, Totowa, New Jersey

Specific information regarding the sampling and analysis program to support each PDI is provided in the RDWP. A summary of the analytical parameters and the methods of analysis are presented in Table 2.3.1.

The specific responsibilities of laboratory personnel involved in the project related to QAPP activities are as follows:

2.3.1 Laboratory Project Manager

The Laboratory Project Manager will report directly to the Haley & Aldrich QAO and will be responsible for ensuring all resources of the laboratory are available on an as-required basis.

The Laboratory Project Manager will also sign all final laboratory data reports provided from the analysis of the project samples and will provide Case Narrative descriptions of any data quality issues encountered during the analyses conducted by the laboratory.

2.3.2 Laboratory QA Officer

The Laboratory QAO will have responsibility for review and validation of the analytical laboratory data generated as part of the PDI. The QAO will also define appropriate quality assurance (QA) procedures, review documentation, and approve the final laboratory analytical reports.

The Laboratory QAO will conduct internal audits of the laboratory procedures and recommend appropriate corrective actions. The Laboratory QAO reports directly to Laboratory Management and will provide written communications to the Haley & Aldrich QAO for any anomalies or corrective actions implemented that affect the reported results for the project samples.

2.3.3 Sample Custodian

The sample custodian will receive and inspect the incoming sample containers, record the condition of the incoming sample containers and sign COC documentation. The custodian will notify the project manager of any non-conformance identified during sample receipt and inspection and assign a unique identification number to each sample. After log-in, the sample custodian will initiate transfer of the samples to appropriate laboratory sections and monitor access/storage of samples and extracts.

2.4 Special Training/Certification Requirements

Field sampling team members will have received 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) safety training and annual 8-hour refresher courses required by 29 CFR Parts 1910 and 1926. On-site subcontractor personnel involved in invasive activities (e.g., excavation/drilling) will have received equivalent training.

Each subcontractor will be responsible for providing documentation of the compliance with the applicable task specific personnel training requirements.

2.5 Project Organization Structure

The project organizational structure for the project is provided in Figure 2.1.

3.0 PROJECT PLANNING / PROBLEM DEFINITION

The purpose of the RDWP and the project objectives and goals for the implementation of the PDIs to be conducted is presented in the following sections.

3.1 Problem Definition

The RDWP has been prepared in accordance with "DER-10 Technical Guidance for Site Investigation and Remediation" (NYSDEC, 2010), Section 5.2, Remedial Design. The purpose of the RDWP is to describe the activities required to prepare a remedial design in accordance with the Record of Decision (ROD). The selected remedy is described in the OU-1 ROD Amendment and the OU-2 ROD (dated March 2012) and is presented in Section 1.6 of the RDWP. The ROD established several remedial goals for the identified site conditions as follows:

For Operable Unit #1 (OU1):

- *Reduce, control, or eliminate to the extent practicable the contamination present within the soils and fill on site, and thereby eliminate the significant threat posed by the presence of hazardous wastes at the site.*

- *Eliminate the potential for direct human or animal contact with the contaminated soils or groundwater on site.*

- *Eliminate the threat to surface waters and sediments by eliminating surface run-off and subsurface releases of fill from the site.*

- *Eliminate, to the extent practicable, the migration of PCBs, metals and other contaminants into the Hudson River by surface and subsurface erosion of contaminated soils, transport of contaminated groundwater, and migration of PCBs in both elastic material and petroleum phases.*

- *Prevent, to the extent possible, migration of contaminants at the site to groundwater and surface water.*

Further, the remediation goals for the site include attaining to the extent practicable:

- *Provide for attainment of SCGs for groundwater quality at the limits of the site.*

For Operable Unit #2 (OU2):

The remedial action objectives (RAO) include:

Surface Water

RAO for Public Health Protection

- *Prevent surface water contamination which may result in fish advisories.*

RAO for Environmental Protection

- *Restore surface water to ambient water quality criteria for the contaminant of concern.*

- *Prevent impacts to biota from ingestion/direct contact with surface water causing toxicity and impacts from bioaccumulation through the marine or aquatic food chain.*

Sediment

RAO for Public Health Protection

- *Prevent direct contact with contaminated sediments.*

- *Prevent surface water contamination which may result in fish advisories.*

RAO for Environmental Protection

- *Prevent releases of contaminant(s) from sediments that would result in surface water levels in excess of (ambient water quality criteria).*

- *Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain.*

- *Restore sediments to pre-release/background conditions to the extent feasible.*

3.2 Project/Task Description

This QAPP has been prepared to prescribe sampling procedures, sample custody, analytical procedures, data reduction validation and reporting, and personnel requirements to ensure that the data generated as part of the PDIs are of appropriate quality to support the remedial design process.

Detailed descriptions for the implementation of each PDI are presented in Appendices 1 through 7 of the RDWP. Below is a general description of each PDI, focusing on the associated data collection, verification, validation, and management procedures to assure the development of the remedial action to address the project goals and achieve the RAO set forth in the ROD.

3.2.1 RDWP Appendix 1: Phase 1 Investigation

RDWP Appendix 1 – Phase 1 Investigation will include the following data collection elements

- A site survey using ground penetrating radar (GPR) will be completed to identify subsurface structures that could affect the implementation of additional data collection activities.
- Groundwater level data loggers will be deployed within existing monitoring wells to obtain groundwater level data that extends over a longer time period than was performed during the remedial investigation (RI) phase of the project.
- The topographic survey for the site will be updated to assist in planning the remaining PDIs and prepare design documents for construction of the remedial systems. In addition, this survey will verify or update site features and investigation locations.

3.2.2 RDWP Appendix 2: OU-1 Supplemental Investigation

RDWP Appendix 2 – OU-1 Supplemental Investigation will include the following data collection activities:

- The installation of seven (7) additional groundwater monitoring wells for the purpose of establishing a more comprehensive understanding of the static water table throughout OU-1.
- Groundwater level data loggers will be deployed within the new monitoring well network and operating in conjunction with the existing monitoring wells described in PDI-1.
- Collection and laboratory analysis from five (5) existing groundwater samples for the purpose of documenting baseline site groundwater quality.
- The assessment of the presence/absence of void spaces and relative size will be performed in areas beneath the existing site concrete slabs.
- Subsurface anomalies that have been previously identified including locations detected by the GPR survey conducted as part of RDWP Appendix 1 will be further investigated.
- Existing Utility Structures including sumps, storm sewers and outfall locations will be verified to assist in the design process. Data collection activities will include historical records review, direct visual observation and video surveys of the existing sewer piping.

3.2.3 RDWP Appendix 3: OU-1 Excavation Pre-Delineation

The current extent of soil quality data collected during the RI and other Site activities is not sufficient to determine the extent of excavation required to achieve the remedial action criteria in the ROD. A pre-delineation sampling plan is described in RDWP Appendix 3.

Excavation pre-delineation sampling will be performed by acquiring representative soil samples at a frequency that complies with the post-excavation confirmation or documentation sampling requirements prescribed by DER-10. The total number of samples and locations will depend on the comparison of the analytical data to the OU-1 soil excavation criteria. If needed, “step-out” samples may be collected at some locations to complete the delineation. Data collection activities will include sample location determinations, chain of custody documentation, sample analysis and reporting, verification, validation and management.

3.2.4 RDWP Appendix 4: Extension Alignment Investigation

The installation of the extension of the bulkhead into the Hudson River in the Northwest Corner of the Site will require an evaluation of the presence/absence of PCB Material as dense non-aqueous liquid (DNAPL) or semi-solid phase along the proposed alignment.

Based on the orientation of the bulkhead wall, this work will be completed on land and offshore. Probes will be completed offshore into underlying sediments using a barge mounted drill rig. Probes will be completed on shore using roto-sonic technology. The number of locations will be field determined based on the observations obtained. The data collection activities will include visual observation of the probe conditions and the determination of the probe placement along the proposed alignment.

3.2.5 RDWP Appendix 5: Deepwater Investigation

The OU-2 ROD requires the determination of additional “significant and contiguous areas of sediment that exceed 50 parts per million (ppm) total PCBs”. This PDI will include the collection of sediment samples in deep water areas for the analysis of total PCBs to achieve this goal.

The number of locations and samples will be based on the comparison of the analytical data to the 50 ppm total PCB criteria. To achieve delineation, “step-out” samples may be collected at some locations. Data collection activities as part of this PDI will include sample location determinations, chain of custody documentation, sample analysis and reporting, and data verification, validation and management.

3.2.6 RDWP Appendix 6: Off-Shore Pre-delineation

Sediment quality data collected during the RI and other Site activities is not sufficient to pre-delineate the extent of dredging required to achieve the remedial goals set forth in the ROD, especially in the areas referred to as the “Backwater” areas consisting of the South Boat Slip, North Boat Slip and the Old Marina, “Nearshore” areas consisting of the expected silt curtain alignment on the west and the OU-1/OU-2 Boundary on the east, and “deepwater” adjacent to the northwest offshore area.

The number of locations and samples to be collected and submitted for laboratory analysis will be based on the comparison of the analytical data to the ROD criteria. To achieve delineation, “step-out” location samples may be collected. Data collection activities as part of this PDI will include sample location determinations, chain of custody documentation, sample analysis and reporting, verification, validation and management.

3.2.7 RDWP Appendix 7: Geotechnical Explorations

The geotechnical explorations will provide additional stratigraphic information for the underlying soils in several areas of the site including in the general vicinity of the planned deadman anchor, in the general vicinity of the planned Northwest Extension bulkhead wall, in the Old Marina, and in the general off-shore area between the North Boat Slip and the South Boat Slip. The information will be used for bulkhead and deadman design, excavation support design, design of the sloped shore, and general site geotechnical analysis (e.g. settlement).

Several test pits will also be installed at various locations around the site where sheetpile support of excavation (SOE) is planned for "hot spot" excavation locations that are 6 ft bgs or greater). The purpose of the test pits will be to gather information on soil conditions, and potential obstructions that could affect the design and/or construction of the sheet pile SOE walls.

3.3 Project Schedule

The project schedule is provided in the RDWP.

4.0 PROJECT DATA QUALITY OBJECTIVES AND MEASUREMENT PERFORMANCE CRITERIA

4.1 Data Quality Objectives (DQO)

DQO are qualitative and quantitative statements derived from the outputs of each step of the investigative process. The DQO process is a series of planning steps based on the scientific method that is designed to ensure that the type, quantity and quality of environmental data used in decision making are appropriate for the intended application.

The seven (7) steps of the DQO process include:

1. Stating the problem
2. Identifying the decision
3. Identifying inputs to the decision
4. Defining the boundaries of the study
5. Developing a decision rule
6. Specifying limits on decision errors
7. Optimizing the design for obtaining data

The decision rules for the major PDIs activities based on the environmental media and investigation goals are provided below.

RDWP Appendix 3: OU-1 Excavation Pre-Delineation

- The purpose of the OU-1 excavation pre-delineation program is to delineate remedial excavation limits based on exceedance of PCB and lead criteria at existing data points.
- The primary decision rule for the Appendix 3 will be to determine the limits of remedial excavation.

  Additional decisions will include the following:
  - Determine the off-site disposal options for the excavated soils

  The inputs to the decision will include the collection of the following types of data and information:
  - Total PCB concentrations will be measured in soil obtained from soil borings completed at horizontal and vertical locations determined based on requirements set forth in DER-10.
  - Lead concentrations will be measured in soil obtained from soil borings completed at horizontal locations determined based on requirements set forth in DER-10.
  - Copper and zinc concentrations will also be measured in soil obtained from soil borings completed at final perimeter locations (determined by lead concentrations at horizontal locations) for documentation purposes.

The spatial boundaries for RDWP Appendix 3 are defined by existing soil data collected during various site investigation events. The temporal boundary will be limited to the time in which the data collection activities are performed. The practical constraints for RDWP Appendix 3 are inclement weather, site access restrictions and subsurface conditions.

The decision rules used to designate excavation areas include:

- Total PCB concentration exceeding criteria at existing data points
- Total PCB concentration below the remedial goal in subsurface soils samples will designate the extent of the excavation limits
- Lead concentrations below the remedial goal in surface soils samples will designate the extent of the excavation limits
- Whether excavated soils are a characteristic hazardous waste based on Total PCB and lead concentrations.

The limits on decision errors for RDWP Appendix 3 include the following:

Type I decision error (false rejection error):
- Incorrectly conclude that an excavation area is noncompliant with the remedial goal
- Consequences of this type of error would result in excavation and disposal of soil that is below exceedance criteria
- Incorrectly conclude that excavated soils are a characteristic hazardous waste
- Consequences of this type of error are more costly disposal and deposition of soils in an alternate landfill

Type II decision error (false acceptance error):
- Incorrectly conclude that an excavation area is compliant with the remedial goal
- Consequences of this type of error are that less excavation than is required by the ROD would be completed. Soil that exceeds criteria would be left in place.
- Incorrectly conclude that excavated soils are not a characteristic hazardous waste
- Consequences of this type of error are that soils are placed in a landfill which is not properly permitted to accept this type of waste.

Method to Optimize the Design for Obtaining Data will include:

- Employ approved EPA methods for Total PCB and lead analyses to provide appropriate sensitivity, accuracy, and precision for decision making
- Employ appropriate test methods to provide sensitivity, accuracy, and precision to effectively characterize the excavated soils for off-site disposal.

RDWP Appendix 4: Extension Alignment Investigation Plan

- The purpose of the OU-1 extension alignment investigation program is to evaluate the presence of PCBM and obstructions along the alignments of the proposed bulkhead extension wall and deadman
- The primary decision rule for the RDWP Appendix 4 will be to determine the alignment of the bulkhead extension wall and deadman.

The inputs to the decision will include the collection of the following types of data and information:

– Presence of PCBM will be evaluated in soil obtained from soil borings completed along the proposed alignment at horizontal locations determined based the anticipated presence of PCBM. The evaluation of the presence of PCBM in the vertical direction will be completed from ground surface to the top 5 feet of the Marine Silt.

The spatial boundaries for RDWP Appendix 4 are defined by the alignment of the proposed alignments and existing soil data collected during various site investigation events. The temporal boundary will be limited to the time in which the data collection activities are performed. The practical constraints for RDWP Appendix 4 are inclement weather, site access restrictions and subsurface conditions.

The decision rules used to designate excavation areas include:

- Visual observation of PCBM in completed borings
- Presence of obstructions that may inhibit installation of sheet piles

<u>The limits on decision errors for RDWP Appendix 3 include the following:</u>

Type I decision error (false rejection error):
- Incorrectly conclude PCBM and obstructions are present
- Consequences of this type of error would result in selecting alternate alignment locations, resulting in additional excavation and disposal of material

Type II decision error (false acceptance error):
- Incorrectly conclude PCBM is not present
- Consequences of this type of error are that sheet pile may be driven through PCBM, dragging the material into the Basal Sand.
- Incorrectly conclude that obstructions to sheet pile installation are not present
- Consequences of this type of error are increased cost of installation due to refusal of sheet piles due to encountered obstructions during installation.

Method to Optimize the Design for Obtaining Data will include:

- Employ appropriate test methods to provide sensitivity, accuracy, and precision to effectively characterize the alignments.

RDWP Appendix 5: OU-2 Deep Water Investigation

- The purpose of RDWP Appendix 5 is to delineate total PCB concentrations in OU-2 deep water designated areas that are known to exceed criteria.
- The primary decision rule for the RDWP Appendix 5 is to determine the limits of the sediment capping/ removal areas to comply with the remedial goals established by the ROD.

The inputs to the decision will include the collection of the following types of data and information:

- Total PCB concentrations will be measured in sediments obtained from samples completed at horizontal and vertical locations as described in Appendix 5.

The spatial boundaries for RDWP Appendix 5 are defined by existing sediment data collected during various investigation events. The temporal boundary will be limited to the time in which the data collection activities are performed. The practical constraints for RDWP Appendix 5 are inclement weather, site access restrictions and subsurface conditions.

For the decision rules to designate excavation areas include:

- Total PCB concentration exceeding the exceedance criteria
- Total PCB concentration below the exceedance criteria will delineate the extent of the sediment capping/removal

The limits on decision errors for RDWP Appendix 5 include the following:

Type I decision error (false rejection error):

- Incorrectly conclude that deepwater sediments are noncompliant with the remedial goal
- Consequences of this type of error would result in capping/removal sediments that are below exceedance criteria

Type II decision error (false acceptance error):

- Incorrectly conclude that deepwater sediments are compliant with the remedial goal
- Consequences of this type of error are that less capping/removal is required by the ROD would be completed. Sediment that exceeds criteria would be left in place.

Method to Optimize the Design for Obtaining Data will include:

- Employ approved sampling and test methods for Total PCB analysis to provide appropriate sensitivity, accuracy, and precision for decision making

RDWP Appendix 6: OU-2 Off-Shore Delineation

- The purpose of RDWP Appendix 6 is to delineate total PCB concentrations in OU-2 off-shore designated areas referred to as the “Backwater” areas consisting of the South Boat Slip, North Boat Slip and the Old Marina, “Nearshore” areas consisting of the expected silt curtain alignment on the west and the OU-1/OU-2 Boundary on the east, and “deepwater” areas that are known to exceed the remedial goal.
- The primary decision rule for the RDWP Appendix 6 is to determine whether the limits of the sediment capping/ removal areas to comply with the remedial goals established by the ROD.

The inputs to the decision will include the collection of the following types of data and information:

- Total PCB concentrations will be measured in sediments obtained from samples completed at horizontal and vertical locations determined based on requirements described in RDWP Appendix 6.

The spatial boundaries for RDWP Appendix 6 are defined by existing sediment data collected during various investigation events. The temporal boundary will be limited to the time in which the data collection activities are performed. The practical constraints for RDWP Appendix 6 are inclement weather, site access restrictions and subsurface conditions.

For the decision rules to designate capping / removal areas include:

- Total PCB concentration exceeding the exceedance criteria
- Total PCB concentration below the exceedance criteria will delineate the extent of the sediment capping/removal

The limits on decision errors for RDWP Appendix 6 include the following:

Type I decision error (false rejection error):

- Incorrectly conclude that backwater sediments are noncompliant with the remedial goal
- Consequences of this type of error would result in capping/removal sediments that are below exceedance criteria

Type II decision error (false acceptance error):

- Incorrectly conclude that backwater sediments are compliant with the remedial goal
- Consequences of this type of error are that less capping/removal is required by the ROD would be completed. Sediment that exceeds criteria would be left in place.

Method to Optimize the Design for Obtaining Data will include:

- Employ approved sampling and test methods for Total PCB analysis to provide appropriate sensitivity, accuracy, and precision for decision making

4.2 Measurement Performance Criteria

The quality assurance program is designed to produce data of the quality necessary to achieve project objectives and meet or exceed the minimum standard requirements for field and analytical methods.

The quality assurance program will include:

- A mechanism for ongoing control of measurement data and evaluation of data quality

- A measure of data quality in terms of precision, accuracy, representativeness, completeness and comparability

The following is a general discussion of the criteria used to measure the DQO, including field and laboratory analytical data quality. Field data collection and associated quality assurance will be the responsibility of Haley & Aldrich and the subcontractors retained for field explorations activities. Laboratory data quality assurance described herein will be the responsibility of the contracted analytical laboratory(s). A summary of the Data Quality Indicators (DQI) and the associated measurement performance criteria is presented in Table 4.2.

4.2.1 Precision

Precision determines the reproducibility of measurements under a given set of conditions or is a quantitative measure of the variability of a group of measurements compared to their average value. Precision will be stated in terms of Relative Percent Difference (RPD) expressed as a percentage of the mean, and a relative range.

The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is much easier to control and quantify than sampling precision. There are more historical data related to individual method performance and the sample "universe" is limited to the samples received within a laboratory. In contrast, sampling precision is unique to each site.

Precision will be determined by collecting and analyzing field duplicate samples and by creating and analyzing laboratory duplicates from the field samples. The analytical results from the field duplicate samples will provide data on sampling precision.

4.2.1.1 Field Precision Criteria

Precision of the field sample collection procedures will be assessed by data from the analysis of field duplicate samples. RPD will be calculated for detected analytes from investigative and field duplicate samples. Field duplicate samples will be collected at a minimum frequency of 1 per 20 investigative samples. The DQO for field duplicate analysis will be +/- 100% RPD for soil/sediments and +/- 35% for surface/groundwater field duplicates for analytes detected in both the investigative and field duplicate samples at concentrations greater than or equal to 5 times the quantitation limit.

4.2.1.2 Laboratory Precision Criteria

Laboratory precision will be assessed through the calculation of RPD for replicate/duplicate sample analyses performed as Matrix Spike/Matrix Spike Duplicate (MS/MSD) and Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) sample analyses. The equation to be used to determine precision is presented in Section 7.3.

Laboratory duplicate analysis will provide data on laboratory precision. Laboratory duplicate analyses will be performed through the use of MS/MSD for organic parameters and Matrix Duplicate (MD) analyses for inorganic parameters.

4.2.2 Accuracy

Accuracy relates to the bias in a measurement system. Bias is the difference between the average value of observed measurements and the "true" value. Sources of error are the sampling process, field contamination, preservation techniques, sample handling, sample matrix, sample preparation and analytical techniques.

4.2.2.1 Field Accuracy Criteria

Evaluating the results of field equipment rinse and trip blanks will assess sampling accuracy. Field equipment rinse and trip blanks will be collected as appropriate for each sampling effort. Field equipment rinse blanks will be collected by passing ASTM Type II de-ionized water or equivalent over and/or through the respective field equipment utilized during each sampling effort. One rinse blank will be collected for each type of field equipment used. Field rinse blanks will be prepared and analyzed for each target parameter for which environmental media have been collected.

Field equipment blank samples will be collected at a frequency of 1 per 20 field samples collected during a sampling event . Equipment blank samples will not be collected for samples collected using pre-cleaned and/or disposable sampling equipment. Equipment blank samples will be analyzed to evaluate contamination from ambient conditions and/or sample container contamination.

Equipment blank samples should not contain target analytes. The equipment and trip blank sample data will be evaluated using the procedures specified in Section 7.3.

Analyzing calibration check samples will assess accuracy of field measurements, specific conductivity, dissolved oxygen, pH and temperature obtained during groundwater sampling events.

4.2.2.2 Laboratory Accuracy Criteria

Analytical accuracy will be assessed through the use of known Laboratory Control Samples (LCS) and project- specific matrix spike sample analyses.

LCS analyses will be performed with each analytical batch of project samples to determine the accuracy of the analytical system. MS/MSD analyses will be performed with each batch of twenty (20) project samples to assess the accuracy of identifying and quantifying analytes within the sample matrices. Additional sample volume (3X) will be collected at sample locations selected for MS/MSD analyses so quantitation limits can be met.

The accuracy of the organics analyses also will be monitored through the analysis of surrogate compounds. Surrogate compounds are added to each sample, standard, blank and Quality Control (QC) sample prior to sample preparation and analysis. Surrogate compound percent recoveries will provide information on the effect that the sample matrix exhibits on the accuracy of the analyses.

4.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, a parameter variation at a sampling point or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. The representativeness criterion is best satisfied selecting sampling locations properly and ensuring that a sufficient quantity of sample is collected.

Representativeness will be addressed by describing sampling techniques and the rationale used to select sampling locations. Sampling locations may be biased (based on existing data, instrument surveys, observations, etc.) or unbiased (completely random or stratified-random approaches) depending on the situation.

Representativeness will also be assessed by the use of field duplicate samples. By definition, field duplicate samples are collected so that they are equally representative of a given point in space and time. In this way, they provide both precision and representativeness information.

4.2.3.1 Field Representativeness Criteria

Representativeness is dependent upon the proper design of the sampling program. The sampling programs are designed to provide data representative of field conditions. For this investigation, sampling will be biased in some instances and random in some instances. The representativeness criteria for field sampling will be to ensure that the sampling locations are properly established on and off site (as applicable), the correct locations are sampled, and that the approved sampling procedures are followed. Appendix 1 provides a summary of the field Standard Operating Procedures (SOP) that will be used for the project.

4.2.3.2 Laboratory Representativeness Criteria

The representativeness criteria for laboratory data will be to ensure that the proper analytical procedures are used for sample preparation (e.g., homogenizing the sample prior to sub-sampling), sample analysis and that sample holding times are met. Additionally, the accuracy and precision of the laboratory data affect representativeness. The laboratory representativeness criteria will include achieving the accuracy and precision criteria for the sample analyses.

4.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data should be comparable with other measurement data for similar samples and sample conditions. This goal is achieved through using standard operating procedures (SOPs) to collect and analyze representative samples and the reporting of analytical results.

The SOPs for the Field Sampling Methods to be implemented during the execution of the RDWP are provided in Appendix 1 and 3 to this plan. A listing of the Laboratory SOPs for the preparation and analysis of the samples collected during the BSAP is provided as Appendix 2. Uncontrolled copies of the Laboratory SOPs are available upon request from the subcontractor laboratories.

4.2.4.1 Field Comparability Criteria

The field SOPs for the various activities to be conducted during this investigation will provide guidelines to generate reproducible results. Comparability of data will be based on the use of Standard Reference Materials (SRM) obtained from either EPA Cooperative Research and Development Agreement (CRADA) suppliers or the National Institute of Standards and Technology (NIST) for instrument initial calibration and continuing calibration verification.

4.2.4.2 Laboratory Comparability Criteria

The reported analytical data will be in standard units of mass of contaminant within a known volume of environmental media.

- Solid Matrices - micrograms (ug) contaminant per kilogram (kg) of media (Dry Weight) or parts per billion (ppb)
- Aqueous Matrices – (Organic parameters) micrograms (μg) per liter (L) of media or parts per billion (ppb)
- Aqueous Matrices - (Inorganic parameters) - milligrams (mg) per liter (L) or parts per million (ppm)
- Ambient Air– milligrams per cubic meter (mg/M^3)

4.2.5 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is essentially the same for all data uses: that a sufficient amount of valid data is generated. The completeness of the data generated will be determined by comparing the amount of valid data, based on independent validation, with the total data set. The completeness goal will be greater than (>) 90%.

4.2.5.1 Field Completeness Criteria

The criteria for field completeness will be that > 90 % of the field measured data are valid. The procedure for determining field data validity is provided in Section 5.8. The equation for calculating completeness is presented in Section 7.3.

4.2.5.2 Laboratory Completeness Criteria

The criteria for laboratory completeness will be that a minimum of 90 % of the laboratory data are determined to be valid (usable) for the intended purpose. Analytical data generated by the laboratory will be validated prior to incorporation into the site database. Validation will be performed by a professional independent of the laboratory, experienced in the analytical procedures performed. Guidance for the data validation will be derived from the "National Functional Guidelines for Organic Data Review", (7/08), and the EPA "National Functional Guidelines for Inorganic Data Review", (7/02). The evaluation of the data completeness will be performed at the conclusion of each sampling and analysis effort. Corrective actions such as revised sample handling procedures will be implemented if problems are noted. The procedure for determining laboratory data validity is provided in Section 5.8. The equation for calculating completeness is presented in Section 7.3.

4.2.6 Sensitivity

Sensitivity is the ability of a method or instrument to detect a parameter to be measured at a level of interest.

4.2.6.1 Field Sensitivity Criteria

The sensitivity of the field instruments selected to measure the pH, temperature, conductivity, ORP, turbidity and DO for this project will be measured by analyzing calibration check solutions, where appropriate, at the lower end of the expected concentration range. The sensitivity of handheld VOC analyzer used to screen samples for VOC (if required) will be less than background readings of ambient air.

Instrument	Parameter	Sensitivity
Water Quality Checker (Horiba U-22 or equivalent)	pH Temperature Conductivity ORP Turbidity Dissolved Oxygen	0-14 0-55°C 0-9.99 S/m ±1999 mV 0-800 NTU 0-19.99 mg/L
PID (MiniRAE Plus or equivalent)	VOCs	0-1999 ppm

4.2.6.2 Laboratory Sensitivity Criteria

The sensitivity requirements for the laboratory analyses presented as method detection limits (MDL) and laboratory reporting limits (RL) are provided in Table 2.3.1.

4.3 Special Training/Certification Requirements

Special training/certification requirements for this project were provided in Section 2.0. Laboratory shall maintain certification through the performance of analytical methodologies prescribed by:

- EPA Contract Laboratory Program Statement of Work (CLP-SOW),
- EPA-500 series methodologies,
- EPA-600 series methodologies,
- EPA "Test Methods for Evaluating Solid Waste" SW-846,
- Standard Methods For The Examination Of Water And Wastewater (APHA/AWWA/WPCF),
- New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP), applicable to the appropriate categories

4.4 Documentation and Records

The documents, records, and reports generated during the project are identified in the following subsections.

4.4.1.1 Field and Laboratory Records

Documents and records generated during the project include sample collection records, QC sample records, field measurement records, laboratory records and data handling records. A brief description of these documents and records are provided below.

Sample collection records that will be used during the sampling activities include field logbooks or standard field forms, soil boring logs, COC records and shipping papers. Field measurements of pH, temperature, conductivity, ORP, turbidity, DO and conductivity will be recorded in bound logbooks or on standard field forms. Calibration data, where applicable, will also be recorded in these logbooks or forms. Field logbooks or standard forms will be used during the project to document the generation of QC samples including equipment blank samples, field duplicate samples and MS/MSD samples.

The laboratory will maintain documentation of trip blank sample preparation, quality records for de-ionized water provided for equipment blank samples, and sample integrity information. Laboratory records that will be maintained for the project include sample receipt documentation, field and laboratory COC documentation, sample container cleanliness certifications, reagent and standard reference material (SRM) certifications, sample preparation records, sample analysis records, including instrument calibration data/raw data, QC data, corrective action reports and final reports.

4.4.1.2 Data Reporting Format

Field data will be recorded in bound logbooks or on standard forms (e.g., soil boring logs). Field data primarily will be from direct-reading meters or field observations. These data will be tabulated and included in project reports or submittals, as appropriate.

The laboratory Project Manager will perform a final review of the laboratory data summary packages and case narratives to determine whether the report meets the project requirements. In addition to the record of the COC, the final laboratory data report format shall consist of the following:

Title Page
- project name and number
- laboratory project or lot number
- signature of the Laboratory QA Officer or his/her designee
- date issued

Table of Contents - laboratory report contents

Case Narrative
- number of samples and respective matrices
- laboratory analysis performed
- any deviations from intended analytical strategy
- definition of data qualifiers used
- QC procedures utilized and references to the acceptance criteria
- condition of samples "as received"
- discussion of whether or not sample holding times were met
- discussion of technical problems or other observations which may have created analytical difficulties
- a discussion of laboratory QC checks which failed to meet project criteria

Analytical Methods Summary - methods of sample preparation and analyses for samples.

Analytical Sample Summary - cross-reference table of laboratory sample to project sample identification numbers.

Shipping and Receiving Documents

- sample container documentation
- sample reception information and original chain of custody record

Chemistry Data Package by Analysis

- Sample Results
  - sample quantitation (reporting) limits (RL), reporting MDL and estimated values between the RL and MDL, provided in an electronic format compatible with EQuIS
  - methods of sample preparation and analyses for samples
  - raw data for sample results (dated chromatograms, parameter specific quantitation reports, mass spectra and instrument printouts)
- QC Summary Data with Current Control Limits
  - MS/MSD recoveries, LCS, method blank results, surrogate recoveries, Gas Chromatography/Mass Spectroscopy GC/MS tuning results, and internal standards (organics)
  - MS recoveries and matrix duplicate relative percent differences, LCS, serial dilutions, method blank results, and reagent blank results and interference check standards (inorganics)
- Standard Data
  - initial calibration data, initial calibration checks, continuing calibration verification/check standards
  - initial and continuing calibration blanks
  - raw data for calibration data (dated chromatograms, parameter specific quantitation reports, mass spectra and instrument printouts)
- Raw QC Data - dated chromatograms, parameter specific quantitation reports, mass spectra and instrument printouts of QC samples.
- Miscellaneous Data
  - instrument run logs
  - sample preparation records
  - instrument conditions

4.4.2 Data Archiving and Retrieval

All records for the PDIs will be maintained consistent with NYSDEC requirements and data results will be provided to the Department in an electronic format compatible with EQuIS.

5.0 DATA GENERATION AND ACQUISITION

The design and implementation of the measurement systems that will be used during the RD/RA project, including sampling and analytical procedures, data handling and documentation are detailed in the following subsections.

5.1 Sampling Process Design

The rationale for the sampling programs is provided in the RDWP.

5.1.1 Sampling Methods

A summary list of the sampling methods and procedures for the collection of soil, sediment, and surface water are provided in Appendix 1: Field Standard Operating Procedures (SOP).

5.1.2 Field Equipment and Sample Container Cleaning Procedures

Cleaning/decontamination procedures for the field sampling and handling equipment are provided in the RDWP. The laboratory will provide sample containers pre-cleaned in accordance with the EPA guidance document entitled "Specifications and Guidance for Contaminant-Free Sample Containers", EPA 540/R-93/051. Example certificates of analysis for each lot of containers to be used during the project will be maintained at the laboratory and available upon request.

5.1.3 Field Equipment Maintenance, Testing, and Inspection Requirements

Field equipment will be inspected and tested prior to being shipped to the field. Prior to use in the field, the equipment will be calibrated, and the performance information will be recorded in the field logbook or daily field form. Any required maintenance will be performed and documented prior to returning the equipment to service. Maintenance logs for field equipment will be kept with the field equipment. Critical spare parts for field equipment and replacement field equipment will be available and can be shipped for overnight delivery, or delivered to the field, if necessary. Alternately, field equipment vendors will provide replacement equipment shipped for overnight delivery as necessary.

5.1.4 Inspection and Acceptance Requirements for Supplies and Sample Containers

Field Task Leaders are responsible for ensuring that the field supplies for the project are acceptable. The field supplies for the sampling activities will include:

- calibration standard solutions for field instrument calibration and calibration checks
- detergent (Alconox) for equipment cleaning
- distilled water for sample collection equipment decontamination
- deionized water for field equipment rinse blank samples
- chemical preservatives for pH adjustment of samples (e.g., nitric acid for metals)
- sample containers to collect the solid and aqueous samples

Field calibration standards (e.g., pH buffers, conductivity solutions) will be traceable to NIST standards. Cleaning detergents (e.g., Alconox) will be laboratory-grade or equivalent. Distilled water will be purchased as needed from a variety of vendors or provided by the laboratory.

Water, chemical preservatives, and sample containers will be provided by the laboratory and will maintain documentation of the purity/cleanliness for these materials. The Laboratory QAO is responsible for ensuring that these materials are acceptable for the project. The acceptability of these materials for use will be evaluated by reviewing lot analysis certificates (deionized water, chemical preservatives, and containers).

5.2 Sample Handling and Custody Requirements

The procedures for sample handling, labeling, shipping, and COC documentation are provided in the subsections that follow. Table 5.2.1 contains sample container, preservation, shipping and packaging requirements.

5.2.1 Sample Handling

The procedures used to collect and label the investigation samples are provided in the FSP. The sample numbering system for the project has been designed to uniquely identify each sample from each sampling program and event.

Example Sample Name: ID-MMDDYY-HHMM

Dashes must separate each code section.

> ID: The first code section represents the sample location's predetermined ID or the four-digit Haley & Aldrich employee ID number of the person that collected the sample (for duplicate or blank samples). For employees with two or three numbers in their employee ID number, zeros will be added in the front so that the section code contains four numbers.
>
> MMDDYY: The second code section represents the six digit date that the sample was collected. One digit days, months, and/or years will be preceded with a zero (ie. 070501). There should be NO slashes, dashes, or periods in the date. The date code should match the sample date recorded on the chain of custody.
>
> HHMM: The third code section represents the time that the sample was collected, in military time. One-digit times will be preceded with a zero (ie. 0101). There should be NO colons, slashes, dashes, or periods in the time. The time code should match the sample time recorded on the chain of custody.

For samples collected as MS/MSD, the ID and date codes will be assigned as described above. The time code will be replaced with the sample code, either MS or MSD.

For samples collected as Field Duplicates, and Field Equipment Blanks, the ID and date codes will be assigned as described above. The time code will be replaced with a sample number (ie. 0001, 0002, 0003), that will be reset for each day of sampling. This will simplify sample naming for the QA/QC samples and avoid identifying the parent sample for blind duplicates. Parent samples will be identified on the Sample Key.

A field code will be written in capital letters in the comments section of the Chain-of-Custody for each sample. The field code will not be part of the sample name. Listed below are appropriate field codes.

N	Field Sample
FD	Field Duplicate (note sample number (i.e. 0001) substituted for time)
TB	Trip Blank (note sample number (i.e. 0001) substituted for time)
EB	Equipment Blank (note sample number (i.e. 0001) substituted for time)
FB	Field Blank (note sample number (i.e. 0001) substituted for time)
MS	Matrix Spike Sample
MSD	Matrix Spike Duplicate Sample

The naming convention described above does not associate samples with the location from which the sample was collected. Therefore, a Sample Identification Key will be used to associate the sample name with the sample location. The Sample Identification Key will be updated upon completion of each sample and will contain additional information regarding the sample (i.e., filtered versus unfiltered, sample matrix, etc.). The information on the Sample Identification Key will exactly match information on sample bottles and the Chain-of-Custody (i.e. date, time, etc.). One Sample Identification Key will be completed for each Chain-of-Custody and will be submitted to the Haley & Aldrich Project Manager.

Information regarding the sample matrix, sampler, date, time, location, depths (if applicable), sample type, parent sample (if applicable) and any other relevant information will be recorded on the Sample Identification Key.

Samples will be placed in shipping coolers containing ice immediately following collection. The samples will be hand-delivered or shipped to the laboratory via an overnight courier service.

The laboratory will group the samples in Sample Delivery Groups (SDG). An SDG is a group of 20 or fewer field samples (including field QC samples) received by the laboratory within 7 calendar days.

5.2.2 Sample Custody

Custody of a sample begins when it is collected by or transferred to an individual and ends when that individual relinquishes or disposes of the sample. A sample is under your custody if:

1. the item is in actual possession of a person
2. the item is in view of the person after being in actual possession of the person
3. the item was in actual possession but is stored to prevent tampering
4. the item is in a designated and identified secure area

5.2.2.1 Field Custody Procedures

The quality of data can be affected by sample collection activities. If the integrity of collected samples is in question, the data, regardless of the analytical quality, will also be in question. Field sampling standard operating procedures will provide for the collection of samples representative of the matrix being investigated.

The following procedures will be used to maintain the integrity of the samples:

- Upon collection, samples are placed in the proper containers. In general, samples collected for organic analysis will be placed in pre-cleaned glass containers, and samples collected for inorganic analysis will be placed in pre-cleaned plastic (polyethylene) bottles
- Samples will be assigned a unique sample number and will be affixed to a sample label. The information to be placed on the sample label includes: the sample ID number, the sample type, the sampler's name, date collected, preservation technique, and analytical parameter and method to be performed. Information on the labels will be completed with indelible ink
- Samples will be properly and appropriately preserved by field personnel in order to minimize loss of the constituent(s) of interest due to physical, chemical or biological mechanisms
- Appropriate volumes will be collected to insure that method or contract required detection limits (or quantification limits) can be successfully obtained and that the required level of QC relative to both precision and accuracy can be completed
- A COC record will be completed during sample collection. The COC records will accompany the samples to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require the individuals relinquishing and receiving the samples to sign, date and note the time of sample transfer on the COC record.
- Samples will be shipped or delivered in a timely fashion to the contract laboratory so that holding-times and/or analysis times as prescribed by the methodology can be met
- Samples will also be transported in containers (coolers) which will maintain the refrigeration temperature for those parameters for which refrigeration is required.
- Field personnel will keep written records of field activities on applicable preprinted field forms or in a bound field notebook. These records will be written legibly to record field data collection activities. The title page of each logbook will contain the following information:
  - person to whom or task for which the logbook is assigned
  - project number
  - project name
  - the starting date for entries into the logbook
  - the ending date for entries into the logbook

All field measurements obtained and samples collected will be recorded. All logbook entries will be made in ink, signed and dated. If an incorrect logbook entry is made, the incorrect information will be crossed out with a single strike mark, initialed and dated by the person making the correction. The correct information will be entered into the logbook adjacent to the original entry.

Whenever a sample is collected or a measurement is made, a detailed description of the location will be recorded in the logbook or standard field form. All equipment used to obtain field measurements will be recorded in the field logbook or standard field form. In addition, the calibration data for all field measurement equipment will be recorded in the field logbook or on standard field forms.

The equipment used to collect samples, time of sample collection, sample description, volume, number of containers and preservatives added (if applicable) will be recorded in the field logbook or standard field form.

5.2.2.2 Laboratory Custody Procedures

The laboratory custody procedures will be based upon the EPA policies and procedures (EPA-330/9-78-001-R). It will be the responsibility of the laboratory sample custodian to receive all incoming samples. Once received, the custodian will document that each sample is received in good condition, that the associated paperwork, such as COC forms, have been completed and will sign the COC forms. In special cases, the custodian will document from appropriate sub-samples that proper preservation has been achieved. The custodian will also document that sufficient sample volume has been received to complete the analytical program. The sample custodian will then place the samples into secure, limited access storage.

Consistent with the analyses requested on the COC form, analyses by the laboratory analysts will begin in accordance with the appropriate methodologies. Empty sample bottles, when the available volume has been consumed by the analysis, will be returned to secure and limited access storage. The samples will be held at least thirty (30) days after reports have been submitted. Disposal of remaining samples will be completed in compliance with pertinent regulations.

5.2.2.3 Final Project Files Custody Procedures

The final project files will be maintained by Haley & Aldrich and will consist of the following:

1. project plan
2. project log books
3. field data records
4. sample identification documents
5. COC records
6. correspondance
7. references, literature
8. final laboratory reports
9. miscellaneous - photos, maps, drawings, etc.
10. final reports

The final project file materials will be the responsibility of the Haley & Aldrich Project Manager. All records for the RD/RA PDIs will be maintained consistent with the requirements of the CD.

5.3 Analytical Method Requirements

The field and laboratory analytical methods that will be used are detailed in the following subsections.

5.3.1 Field Analytical Methods

Standard Operating Procedures (SOPs) for the field measurements are provided in the RDWP. Field-portable pH/temperature, conductivity, oxidation and reduction potential (ORP), dissolved oxygen

(DO) and turbidity meters will be used to analyze aqueous samples. The data from these analyses will be used to determine the time for the collection of representative samples.

5.3.2 Laboratory Analytical Methods

Soil, surface water, groundwater and sediment samples will be analyzed off site in accordance with the EPA methodology requirements promulgated in:

- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846 EPA Office of Solid Waste, 3rd Edition and promulgated updates, (1986).

- American Society for Testing and Materials (ASTM) Standards. (Current Revision)

The analytical methodology that will be used for the analysis of soil, sediment, and surface water samples are presented in Table 2.3.1. A summary of the field samples to be collected and associated field and laboratory quality control and quality assurance samples to be analyzed as part of the project is presented in Table 5.3.1

5.4 Quality Control (QC) Requirements

The field and laboratory quality control requirements for the PDI activities are discussed in the following subsections.

5.4.1 Field Quality Control

Field QC requirements include analyzing reference standards for instrument calibration and for routine calibration checks in accordance with the manufacturer's recommendations.

Field QC samples for this project include field blank samples to determine the existence and magnitude of sample contamination resulting from ambient conditions or sampling procedures, field duplicate samples to assess the overall precision of the sampling and analysis events, and trip blank samples to monitor cross-contamination of samples by VOC.

5.4.2 Analytical Quality Control

Analytical QC procedures are documented in the laboratory specific SOP, which addresses the minimum QC requirements. A list of the applicable Laboratory SOPs is provided in Appendix 2 to this plan. The internal QC checks vary for each analytical procedure but in general will include the following QC elements:

1. Standard Reference Materials
2. Instrument Performance Checks – Organics
3. Initial and Continuing Calibration Checks
4. Internal Standard Performance
5. Method Blank Samples
6. Laboratory Control Samples
7. MS/MSD

8. System Monitoring Compounds/Surrogates
9. Inductively Coupled Plasma (ICP) Interference Check Samples (ICS)
10. ICP Serial Dilution
11. ICP and ICP/Mass Spectrometer QC Analyses
12. Reagent Checks

The laboratory data package will include a summary of QC sample data. Any project samples analyzed concurrently with non-conforming QC samples will be re-analyzed by the laboratory, if sufficient sample volume is available.

5.5 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

The use of materials of known purity and quality will be utilized for the analysis of environmental samples. The laboratory will carefully monitor the use of all laboratory materials including solutions, standards and reagents through well-documented procedures.

All solid chemicals and acids/bases used by the laboratory will be reagent grade or better. All gases will be high purity or better. All standard reference materials (SRM) will be obtained from approved vendors of the NIST (formerly National Bureau of Standards), the EPA Environmental Monitoring Support Laboratories or reliable commercial sources.

All materials including standards or standard solutions will be dated upon receipt, and will be identified by material name, lot number, purity or concentration, supplier, receipt/preparation date, recipient/preparer's name, expiration date and all other pertinent information. The procedures used to verify that instruments and equipment are functional and properly maintained are described in the following subsections.

5.5.1 Field Instrument Maintenance

The field equipment for this project includes field-portable Photo-ionization Detector (PID) systems, pH/temperature, specific conductivity, ORP, DO and turbidity meters. Specific preventive maintenance procedures to be followed for field equipment are those recommended by the manufacturer. Field instruments will be checked and calibrated before use.

5.5.2 Laboratory Instrument Maintenance

As part of its QA/QC program, the laboratory will conduct routine preventive maintenance program to minimize the occurrence of instrument failure and other system malfunctions. Designated laboratory employees will regularly perform routine scheduled maintenance and repair of (or coordinate with the instrument manufacturer for the repair of) all instruments. All maintenance that is performed will be documented in the laboratory's maintenance logbooks. All laboratory instruments are maintained in accordance with manufacturer's specifications.

5.6 Calibration Procedures and Frequency

The procedures for maintaining the accuracy for all the instruments and measuring equipment which are used for conducting field tests and laboratory analyses are described in the following subsections. These instruments and equipment will be calibrated in accordance with the manufacturer’s specifications before use.

5.6.1 Direct Reading Instruments/Equipment

Instruments and equipment used to measure environmental data will be calibrated in accordance with the manufacturer’s specifications.

The field instruments include DO meters, pH meters, turbidity meters, specific conductance meters and PID systems. Field instruments will be used for real-time sample measurement during monitoring well sampling and organics screening for both on-site screening of soil samples and for health and safety air monitoring.

Field instruments will be calibrated prior to use and the calibration will be verified periodically during use. Satisfactory completion of the pre-operation inspection will be noted on the Field Sampling Record, along with the results of the field measurements.

5.6.2 Non-direct Reading Instruments

Calibration procedures for non-direct reading instruments will consist of initial calibration, initial calibration verification and continuing calibration verification. The SOP for each analysis to be performed in the laboratory describes the calibration procedures, the frequency, acceptance criteria and the conditions that will require re-calibration.

5.7 Inspection/Acceptance Criteria for Supplies and Consumables

The procedures that will be used to ensure that supplies and consumables used in the field and laboratory will be available as needed and free of contaminants are detailed in the following subsections.

5.7.1 Field Supplies and Consumables

Supplies and consumables for field measurements and sampling will be obtained from various vendors and include standards for field meter calibration, sample containers, preservatives, detergent and water for equipment decontamination. Additional field supplies and consumables will include pump tubing and Personal Protective Equipment (PPE). Pump tubing will be constructed of pre-cleaned High-Density Polyethylene (HDPE). This material will not introduce contaminants into the samples or interfere with the analyses. All field supplies will be consumed or replaced with sufficient frequency to prevent deterioration or degradation that may interfere with the analyses and PDI activities.

5.7.2 Laboratory Supplies and Consumables

The Laboratory QAO is responsible for the ensuring the acceptability of supplies and consumables. The laboratory SOPs provide details on determining deterioration of reagents and standards, and the corrective actions required if contaminants or deterioration are identified.

5.8 Data Management

The procedures for managing data from generation to final use and storage are detailed in following subsections.

5.8.1 Data Recording

Field data will be recorded in field logbooks or on standard forms and consist of measurements from direct reading instruments or direct measurements. Field staff personnel are responsible for recording field data and the Project Manger or his designee is responsible for identifying and correcting recording errors.

Laboratory data are recorded in a variety of formats. The laboratory SOPs provide the data recording requirements for each preparation and analysis method to be used in support of the PDI activities.

5.8.2 Data Validation

Validation of field data for this project will primarily consist of checking for transcription errors and review of data recorded in field logbooks or on standard forms. Data transcribed from the field logbook or standard forms into summary tables for reporting purposes will be verified for correctness by the QAO or his designee.

The final laboratory reports will be checked for completeness of each data package by qualified Data Validation staff. Completeness checks will be administered on all data to determine whether all required deliverables are present. At a minimum, deliverables will include sample COC forms, analytical results, QC summaries and supporting raw data from instrument printouts. The review will determine whether all required items are present and request copies of missing deliverables.

Validation of the analytical data will be performed by the QAO or his designee based on the evaluation criteria outlined in "EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA 540/R-99/008, October 1999, and "EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", EPA 540/R-01-008, July 2002. Data qualification and corrective actions specified in these documents will be used for qualification of the data.

Organic Analysis
1. technical holding times
2. GC/MS instrument performance check
3. initial and continuing calibration
4. internal standard performance
5. method, trip and field blanks
6. system monitoring compounds (surrogate spikes)
7. MS/MSD results

8. LCS
9. field duplicate samples

Inorganic Analysis

1. technical holding times
2. initial calibration
3. initial and continuing calibration verification
4. blanks
5. ICP interference check samples
6. ICP serial dilutions
7. LCS
8. MS and matrix duplicate results
9. field duplicate samples

The data validation staff will generate a data usability summary report (DUSR) for each sample delivery group, utilizing the EPA "National Functional Guidelines for Organic Data Review," US EPA 2008, the "National Functional Guidelines for Inorganic Data Review," revised 7/02 and EPA Region 2 Data Validation SOPs, and supply the findings to the project data management team. The DUSR will include data qualification and corrective actions recommendations for incorporation into the final project database.

Data validation will include two (2) tiers of review based on guidance provided from "Innovative Approaches to Data Validation", US EPA Region III, June 1995. All laboratory data from the analysis of samples collected as part of the project will undergo Tier 1 data review and verification with, 10 percent (%) of the reported results subject to full Tier 2 data validation.

5.8.3 Data Transformation/Data Reduction

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. Only direct read instrumentation will be employed in the field. The pH, conductivity, temperature, turbidity and VOC readings collected in the field will be generated from direct read instruments following calibration per manufacturer's recommendations. Such data will be written into field logbooks or standard forms immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed and dated by the field team member, and corrected in a space adjacent to the original entry.

The methods and procedures employed to reduce laboratory data will be in accordance with the applicable chapter of SW-846, Third Edition. All calculations are checked by qualified laboratory personnel at the conclusion of each operating day. If errors are noted, the corrections will be made with the original notations crossed out legibly. Analytical results for soil samples shall be calculated and reported on a dry weight basis.

QC data (e.g., laboratory duplicates, surrogates, MS/MSD will be compared to the method acceptance criteria. Data considered to be acceptable will be entered into the laboratory computer system. Data summaries will be sent to the Laboratory QAO for review. If approved, data will be logged into the project database format. Unacceptable data shall be appropriately qualified in the project report. Case narratives will be prepared which will include information concerning data that fell outside acceptance limits and any other anomalous conditions encountered during sample analysis.

5.8.4 Data Transmittal/Transfer

The Haley & Aldrich QAO or his designee is responsible for verifying the correctness of the field data after the data are transferred to a spreadsheet and/or database format. The chemical analysis data are maintained in a database that is described below.

Laboratory data will be provided as electronic data deliverables (EDD) in a Microsoft Access® and EQuIS compatible format. The laboratory data will be downloaded into the EDD directly from the laboratory information management system (LIMS).

5.9 Data Assessment

Assessment of laboratory data will be performed using the procedures detailed in the laboratory specific SOPs. These assessments included determining the mean, standard deviation, percent difference, RPD and percent recovery for spike sample analyses.

Assessment of QC data for data validation purposes will include determining the mean, standard deviation, percent difference, percent recovery, RPD and percent completeness. The statistical equations to determine percent recovery, RPD and percent completeness are provided in Section 7.3.

5.10 Data Storage and Retrieval

Laboratory data will be stored by Haley & Aldrich in hardcopy format. Electronic instrument data are maintained on magnetic media for the time period required by the ROD. All laboratory records for this project will be maintained consistent with the storage requirements in the ROD.

6.0 ASSESSMENT/OVERSIGHT

The following subsections describe the procedures used to ensure proper implementation of this QAPP and the activities for assessing the effectiveness of the implementation of the project and associated QA/QC activities.

6.1 Assessments and Response Actions

Assessments consisting of internal and external audits may be performed during the project. Internal technical system audits of both field and laboratory procedures will be conducted to verify that sampling and analysis are being performed in accordance with the procedures established in the RDWP and QAPP. External field and laboratory audits may be conducted by NYSDEC.

Internal audits of field activities include the review of sampling and field measurements conducted by the Haley & Aldrich QAO or designee. The audits will verify whether procedures are being followed. Internal field audits will be conducted once during each phase of the sampling and at the conclusion of the project. The audits will include examination of the following:

- Field sampling records, screening results, instrument operating records
- Sample collection
- Handling and packaging in compliance with procedures
- Maintenance of QA procedures
- COC reports

Follow up audits will be conducted to correct deficiencies, if any, and to verify that procedures are maintained throughout the investigation. Corrective action resulting from internal field technical system audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. The QAO will identify deficiencies and recommended corrective action to the Project Manager. The Field Task Leaders and field team will perform implementation of corrective actions. Corrective action will be documented in the field logbook and/or the project file. Follow up audits will be performed as necessary to verify that deficiencies have been corrected, and that the QA/QC procedures described in this QAPP are maintained throughout the project.

The laboratory QAO or designee will conduct an internal laboratory technical system audit. The laboratory technical system audit is conducted on an annual basis and includes examining laboratory documentation regarding sample receiving, sample log-in, storage and tracking, COC procedures, sample preparation and analysis, instrument operating records, data handling and management, data tracking and control and data reduction and verification. The laboratory QAO will evaluate the results of the audit and provide a final report to section managers that will include any deficiencies and/or noteworthy observations.

Corrective action resulting from deficiencies identified, if any, during the internal laboratory technical system audit will be implemented immediately. The Project Manager or section leaders, in consultation with the laboratory supervisor and staff, will approve the required corrective action to be implemented by the laboratory staff. The laboratory QAO will ensure implementation and documentation of the corrective action. All problems requiring corrective action and the corrective action taken will be reported to the laboratory Project Manager. Follow up will be performed as necessary to verify that deficiencies have been corrected, and that the QA/QC procedures described in the QAPP are maintained throughout the project.

A review of a data package from samples recently analyzed by the laboratory can include (but not be limited to) the following:

- Comparison of resulting data to the SOP or method
- Verification of initial and continuing calibrations within control limits
- Verification of surrogate recoveries and instrument timing results
- Review of extended quantitation reports for comparisons of library spectra to instrument spectra, where applicable
- Assurance that samples are prepared and analyzed within holding times

6.2 Reports to Management

Quality Assurance (QA) Management Reports will be prepared during the RD/RA. Minimally, these reports will include project status, results of system audits, results of periodic data quality validation and assessment and data use limitations and any significant QA problems identified and corrective actions taken.

The Haley & Aldrich QAO will be responsible within the organizational structure for preparing these reports. The Project Manager will be provided with these reports for distribution with monthly status reports, if appropriate.

The 30% Remedial Design Report will include a section that summarizes the data quality information contained in the periodic QA Management Reports and will provide an overall data quality assessment compared to the DQO outlined in this QAPP.

Table A.1
Methods of Analysis and Reporting Limits

Target Analytes	Methods of Preparation and Analysis	Matrix	Method Detection Limit (ug/Kg)	Laboratory Reporting Limit (ug/Kg)
Total Hardness	EPA 130.2	Ground Water	5 mg/l	25 mg/l
Total Dissolved Solids (TDS)	SM 2540C		0.0015 mg/l	0.005 mg/l
Total Lead (Pb)	EPA 3015A/6010C			5 ug/l
Total PCBs as Aroclors	EPA 3546/8082A		0.1 ug/l	0.05 ug/l
Total Organic Carbon (TOC)	SM 5310B		0.2 mg/l	1.0 mg/l
Total PCBs as Aroclors	EPA 3546/8082A	Soil	5.0 - 15	50
Total Lead (Pb)	EPA 3015A/6010C		132	500
Total Zinc (Zn)			37	500
Total Copper (Cu)			62	500
Total PCBs as Aroclors	EPA 3546/8082A	SED	5.0 - 15	50
Total Lead (Pb)	EPA 3015A/6010C		132	500
Total Copper (Cu)			37	500
Total Zinc (Zn)			62	500
Moisture Content	ASTM D2216	Soil	NA	NA
Grain Size Analysis	ASTM D422			
Atterberg Limits	ASTM D4318			
Organic Content	ASTM D2974			
Specific Gravity	ASTM D854			
One-Dimensional Consolidation	ASTM D4186			
UU Triaxial Test	ASTM D2850			
CU Triaxial test	ASTM D4767			
Total PCBs as Aroclors	EPA TO-10A	Air	0.04 $\mu g/m^3$ *	0.1 $\mu g/m^3$ *

Notes:
ug/kg = micrograms per kilogram or parts per billion (ppb)
µg/m3 = micrograms per cubic meter
PDI = Pre-Design Investigation
SED = Sediment
EPA = Test Methods for Evaluating Solid Waste, SW-846 3rd Edition with updates
ASTM = American Society for Testing and Materials
NA = Not Applicable
* Assumes a minimum run time of 3.5 hours.

TABLE A.2
Data Quality Indicators (DQI)

Parameter	Matrix	Data Quality Indicators	Measurement Performance Criteria	QA Sample Used to Assess Measurement Performance	QC Sample Assessed Error Sampling (S), Analytical (A) or both (S&A)
Total Hardness	Ground Water	Precision	<35% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS	A
Total Dissoved Solids (TDS)		Precision	<35% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS	A
Lead, Total		Precision	<35% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS	A
Total PCBs as Arochlors		Precision	<35% RPD	Field Duplicate	S&A
		Accuracy	50-150% True Value	LCS and MS/MSD	A
Total Organic Carbon		Precision	<35% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS/MSD	A
Lead, Total	Soil	Precision	<35% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS	A
	SED	Precision	<100% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS	A
Zinc, Total	Soil	Precision	<35% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS	A
	SED	Precision	<100% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS	A
Copper, Total	Soil	Precision	<35% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS	A
	SED	Precision	<100% RPD	Field Duplicate/Lab Duplicate	S&A
		Accuracy	75-125% True Value	LCS and MS	A
Total PCBs as Aroclors	Soil	Precision	<35% RPD	Field Duplicate	S&A
		Accuracy	50-150% True Value	LCS and MS/MSD	A
		Precision	<35% RPD	MS/MSD	A
	SED	Precision	<100% RPD	Field Duplicate	S&A
		Accuracy	50-150% True Value	LCS and MS/MSD	A
		Precision	<35% RPD	MS/MSD	A
	Air	Accuracy	60-120% True Value	LCS	A

Notes:

RPD - Replicate Percent Difference

MS/MSD - Matrix Spike Matrix Spike Duplicate

LCS - Laboratory Control Sample

Table A.3

Sample Preservation, Handling and Holding Times

Parameter	Matrix	Sample Volume/Weight[1]	Containers (Number, size & type)	Preservation Requirements	Holding Time[2]
Geotechnical Parameters[3]	Soil	Varies	Polyethylene Container	NA	NA
Total Hardness	Ground Water	100 ml	250 ml HDPE	HNO_3, 4 ± 2ºC	180 days
Total Dissolved Solids (TDS)	Ground Water	100 ml	250 ml HDPE	HNO_3	180 days
Lead (Pb), Total	Ground Water	100 ml	250 ml HDPE	HNO_3	180 days
Total PCBs as Aroclors	Ground Water	1000 ml	2 x 1000 ml amber glass	4 ± 2ºC	180 days extract, 40 days analyze
Total Organic Carbon (TOC)	Ground Water	150 ml	500 ml glass	H_2SO_4	28 days
Lead (Pb), Total	Soil	10 g	4 oz glass jar	4 ± 2ºC	180 days
	SED	2 g			
Copper (Cu), Total	Soil	10 g			
	SED	2 g			
Zinc (Zn), Total	Soil	10 g			
	SED	2 g			
Total PCBs as Aroclors	Soil	10 g	4 oz glass jar w/Teflon lined lid	4 ± 2ºC	180 days extract, 40 days analyze
	SED	10 g			
	Air	1 m^3	1 x PUF Cartridge[4]	4 ± 2ºC	7 days extract, 40 days analyze

Notes:

[1] - Represents amount needed by the laboratory, actual sample volume will be greater.

[2] - Holding time is determined from the time of sample collection to the time of sample preparation and/or analysis.

[3] - Geotechnical Parameters include: Moisture Content; Grain Size; Atterberg Limits; Organic Content; Specific Gravity; UU and CU Triaxial Tests

[4] - Polyurethane Foam

NA = Not Applicable

g = gram

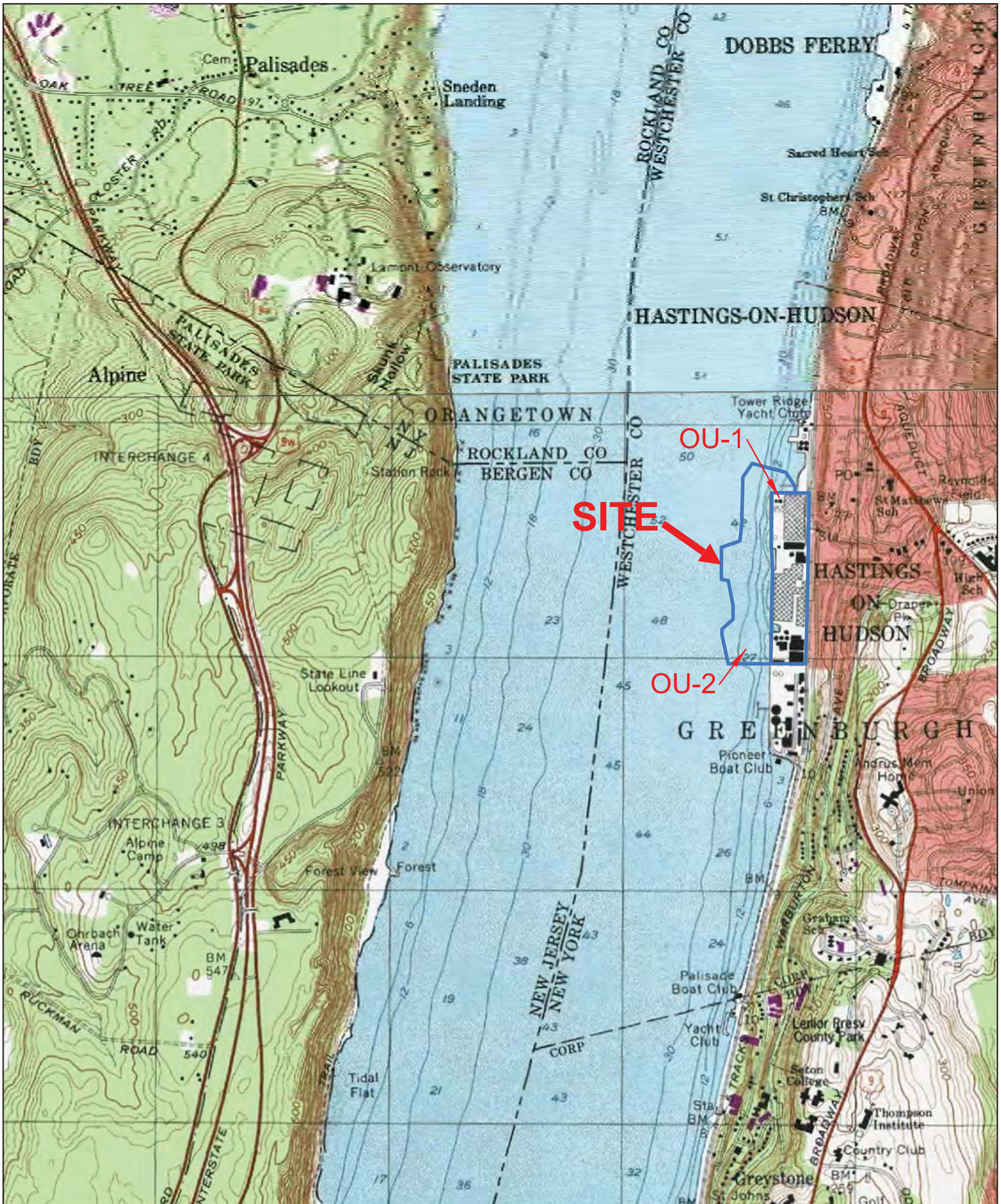
oz = ounce

°C = degrees Celsius

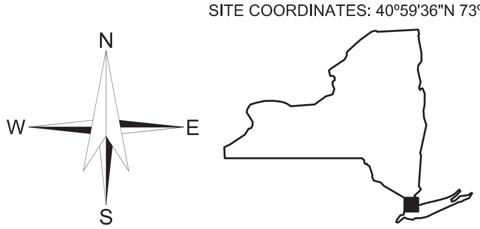
Table A.4
Field and Laboratory Quality Control Sample Summary

<table>
<tr><th rowspan="2">Matrix</th><th rowspan="2">Parameter</th><th rowspan="2">Analytical Method/
SOP Reference</th><th rowspan="2">No. of Samples</th><th rowspan="2">No. of Field Duplicate Pairs</th><th>Organic</th><th colspan="2">Inorganic</th><th rowspan="2">No. of Equip. Blanks (Field)</th><th rowspan="2">Total No. of Sample Results</th></tr>
<tr><th>No. of MS/ MSDs</th><th>No. of Lab Duplicates</th><th>No. of MS</th></tr>
<tr><td rowspan="5">Ground Water</td><td>Total Hardness</td><td>EPA 130.2</td><td rowspan="5">3</td><td rowspan="5">1</td><td>-</td><td rowspan="3">1</td><td rowspan="3">1</td><td rowspan="5">1</td><td rowspan="3">7</td></tr>
<tr><td>Total Dissolved Solids (TDS)</td><td>SM 2540C</td><td>-</td></tr>
<tr><td>Lead, Total</td><td>EPA 3015A/6010C</td><td>-</td></tr>
<tr><td>Total PCBs as Aroclors</td><td>EPA 3546/8082A</td><td>1</td><td>-</td><td>-</td><td>6</td></tr>
<tr><td>Total Organic Carbon (TOC)</td><td>SM 5310B</td><td>1[1]</td><td>-</td><td>-</td><td>6</td></tr>
<tr><td rowspan="4">Soil</td><td>Total PCBs as Aroclors</td><td>EPA 3546/8082A; S-NY-O-314-rev.00 & NE_278_00</td><td>507</td><td>51</td><td>26</td><td>NA</td><td>NA</td><td>26</td><td>610</td></tr>
<tr><td>Lead, Total</td><td rowspan="3">EPA 3015A/6010C; NE_295_00</td><td rowspan="3">16</td><td rowspan="3">2</td><td rowspan="3">NA</td><td rowspan="3">1</td><td rowspan="3">1</td><td rowspan="3">1</td><td rowspan="3">21</td></tr>
<tr><td>Zinc, Total</td></tr>
<tr><td>Copper, Total</td></tr>
<tr><td>SED</td><td>Total PCBs as Aroclors</td><td>EPA 3546/8082A; S-NY-O-314-rev.00 & NE_278_00</td><td>168</td><td>17</td><td>9</td><td>NA</td><td>NA</td><td>9</td><td>203</td></tr>
<tr><td rowspan="4">SED</td><td>Lead, Total</td><td rowspan="3">EPA 3015A/6010C; NE_295_00</td><td>160</td><td>16</td><td rowspan="3">NA</td><td>8</td><td>8</td><td>8</td><td>200</td></tr>
<tr><td>Zinc, Total</td><td>135</td><td>14</td><td>7</td><td>7</td><td>7</td><td>170</td></tr>
<tr><td>Copper, Total</td><td>135</td><td>14</td><td>7</td><td>7</td><td>7</td><td>170</td></tr>
<tr><td>Total PCBs as Aroclors</td><td>EPA 3546/8082A; S-NY-O-314-rev.00 & NE_278_00</td><td>304</td><td>30</td><td>15</td><td>NA</td><td>NA</td><td>16</td><td>365</td></tr>
<tr><td>Soil</td><td>Geotechnical Parameters</td><td>ASTM D2216; D422; D4318; D2974; D854; D2850; D4767; D4186</td><td>21</td><td>2</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td><td>23</td></tr>
<tr><td>Air</td><td>Total PCBs as Aroclors</td><td>EPA 10A</td><td>60</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td><td>60</td></tr>
</table>

Notes:
PDI = Pre-Design Investigation
SED - Surficial Sediment
MS/MSD - Matrix Spike / Matrix Spike Duplicate Sample
MS- Matrix Spike
Geotechnical Parameters include: Moisture Content; Grain Size; Atterberg Limits; Organic Content; Specific Gravity; UU and CU Triaxial Tests
NA = Not Applicable
[1] TOC Analysis will also include Lab Duplicate.



SITE COORDINATES: 40º59'36"N 73º53'9"W



U.S.G.S. QUADRANGLE: HASTINGS-ON-HUDSON, NEW YORK

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

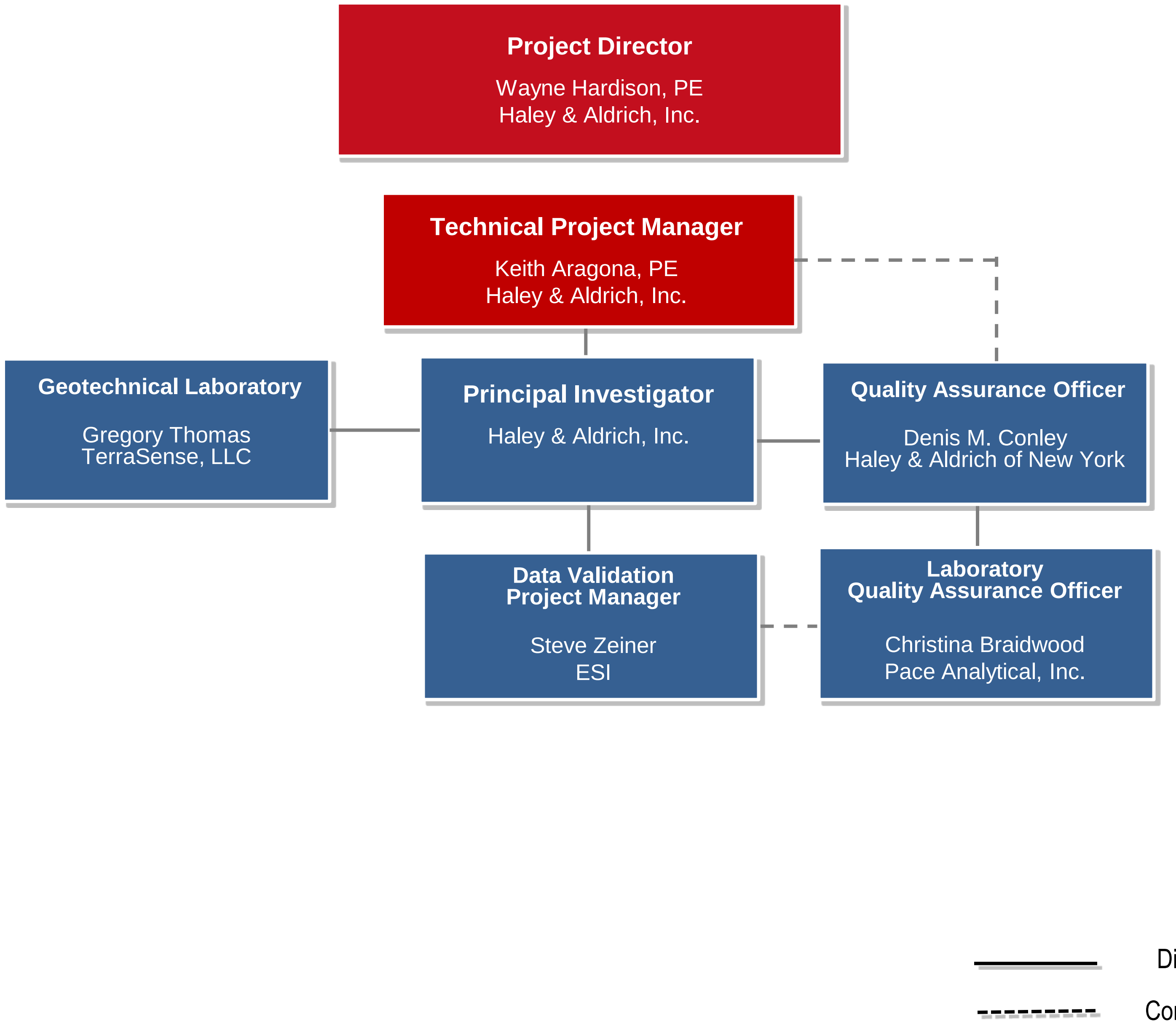
Site Locus

SCALE: 1:24000
MAY 2011

FIGURE 1.1

G:\PROJECTS\28612\250 - RFS\CAD\PLAN VIEWS & SECTIONS\28612-LOCUS_D1.DWG

Figure 2.1
Project Organizational Chart



Appendix 1

Haley & Aldrich Standard Operating Procedures

Operating Proceedures

OP1001 – Excavation and Trenching
OP1002 – Drilling Safety
OP1004 – Operation / Calibration of PID Photoionization Detector
OP1008 – Operations Over, Near, or On Water
OP1020 – Work Near Utilities
OP2000 – Monitoring Field Explorations
OP2001 – Identification and Description of Soils Using Visual-Manual Methods
OP2005 – Test Borings, Sampling, Standard Penetration Testing and Borehole Abandonment
OP2007 – Undisturbed Fixed Piston Tube Sampling
OP3001 - Preservation and Shipment of Environmental Samples
OP3003HOH - Subsurface Soil Sampling
OP3004 - Sediment Sampling
OP3012 - Low Stress/Low Flow Groundwater Sample Collection Procedure
OP3026 - Chain of Custody
OP3027 – Decontamination Procedure
OP3029 – Field Data Recording
OP3030 - Field Instruments: Use and Calibration
OP3028 - Investigation Derived Wastes (IDWs)

Note: Operating Proceedures are available upon request.

Appendix 2

Laboratory Standard Operating Procedures

APPENDIX 2

Summary of Laboratory Standard Operating Procedures
Remedial Design Work Plan (RDWP)
Former Anaconda Wire and Cable Site
Hastings on Hudson, New York

Laboratory Analytical Method Reference	Extraction Method Reference	Matrix	Standard Operating Procedure (SOP)[1]
EPA 8082a PCB Aroclors (Low Level)	Solid Phase (SPE) EPA 3535	Groundwater	S-NY-O-314-rev.00
TOC/DOC SM 5310	N/A	Groundwater	NE_128_08
EPA 8082a Solid Phase (SPE) EPA 3535 (Centrifuged/Dissolved PCBs)	Solid Phase (SPE) EPA 3535	Groundwater	S-NY-O-314-rev.00
EPA 8082a PCB Aroclors	Microwave Extraction EPA 3546	Suficial Sediment/Soil	S-NY-O-314-rev.00
EPA 7470A	CVAA	Groundwater	NE_025_11
EPA 6010C	Microwave Digestion EPA 3015A	Suficial Sediment, Soil & Groundwater	NE_295_00
EPA 200.7	Acid Digestion EPA 3050	Groundwater	NE_122_09
EPA TO-10A	N/A	Air	SNY_0_241

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Pace Analytical Services Inc
2190 Technology Drive
(518) 346-4592

1. Uncontrolled Copies of Pace Analytical Laboratory SOPs are available upon request.
2. N/A - Not Applicable for this parameter
3. PCB - Polychlorinated Biphenyls
4. TOC/DOC - Total Organic Carbon/Dissolved Organic Carbon
5. EPA - United States Environmental Protection Agency
6. SM - Standard Methods for the Examination of Wastewater and Wastes

Appendix 3

Subcontractor Standard Operating Procedures

Appendix 4

Key Personnel Resumes

WAYNE C. HARDISON, P.E.

Program Manager

Over 37 years of experience in industrial and environmental systems design

Education
University of Tennessee, MSIE, Engineering Management, 1993
University of Tennessee, B.S.E., Mechanical Engineering, Magna Cum Laude, 1978
David Lipscomb College, Nashville, TN 1974

Professional Registration
Professional Engineer:
1990/New York (Reg. No. 067080)
2000/ Nebraska (Reg. No. E-9961)
2000/Michigan (Reg. No. 6201045810
1995/Kentucky (Reg. No. 22982)
Inactive/Tennessee (Reg. No. 00015176)

Professional Societies
Project Management Institute

Mr. Hardison brings over 37 years of engineering experience to our environmental engineering practice. He has a strong background in mechanical (industrial and environmental systems) design, construction administration and project management. Mr. Hardison is responsible for the coordination of multi-discipline and multi-office project assignments for Haley & Aldrich. He has significant project management experience on remedial design/remedial implementation projects, and is recognized for his ability to focus on customer requirements and issues in order to achieve business objectives.

Relevant Project Experience

1 River Street, Atlantic Richfield, Hastings on Hudson, NY. Program manager for remediation of soils and sediments impacted with polychlorinated biphenyl (PCB) and metals at the former Anaconda Wire & Cable site. Project includes coordinating multiple disciplines, design studies, pilot testing, bulkhead design, extensive removal of soils and sediment adjacent to and in the Hudson River, transportation and disposal, water treatment, and other related tasks to comply with the New York State Department of Environmental Conservation Consent Order and a Federal Consent Decree. The project also includes delineating site dense non-aqueous phase liquid (DNAPL), revising the site conceptual model, supplemental investigations, and completing a feasibility study to develop an integrated off-shore and on-shore remedy. The off-shore remedy includes a combination of capping and dredging. Total construction cost is estimated to exceed $100 Million.

Environmental Reserve Review, Confidential Client. Member of team to review and validate the basis for existing corporate environmental reserves exceeding $100 Million. Team leader to complete similar assessment of the portfolio related to operation and maintenance (O&M) including development of common process program, consolidation of individual sites into sub-portfolios, cost-reduction and compliance enhancements.

Confidential Client, Nebraska. Project manager for design/build remediation system consisting of dual-phase extraction system as a chlorinated solvent source measure and a permeable reactive barrier (PRB) wall for off-site migration at an operating industrial facility. Project includes design, development of operating and maintenance plan, on-going operations, refinement of the site conceptual model, reserve planning and development of a closure strategy.

Confidential Client, New Jersey. Third party review of remedial action plan and remedial design for National Priorities List site in Wisconsin. Operable Unit includes estimated 3800 cu yd of PCB-contaminated surficial flood plain soil/sediment and 71,000 cu yd of river sediment. Removal action estimated cost is $30 Million.

Former Manufactured Gas Plant (MGP) Site, Tarrytown, NY. Design manager for remedial action for brownfield site redevelopment with residential and commercial buildings, riverwalk, ferry terminal and municipal facilities. Project included conceptual design, estimating and contracting for >$5 Million design/ build remediation of MGP DNAPL site and diesel fuel light non-aqueous phase liquid (LNAPL) along Hudson River for mixed use redevelopment. The project also included development of operating and closure strategy as well as refinement of the site conceptual model. The design process was integrated with the remediation contractor to evaluate alternative approaches, obtain regulatory approval and adapt to field condition discovered by concurrent geotechnical and environmental investigation activities. Final design included an innovative DNAPL barrier, recover trench, slurry wall; sediment removed and impacted soil removed and resulted in millions of dollars of reduced implementation costs.

Confidential Aerospace Manufacturer, Design Quality Control. Technical reviewer for remedial design for various sites including groundwater recovery, excavated soil management and treatment and vapor migration control for redevelopment sites.

Remediation Value Engineering Third Party Review, Confidential Client, New Hampshire. Prepared independent estimate and value engineering proposals for remediation of lead impacted soils on and off site.

Confidential Client, Dayton, OH. Design manager for DNAPL recovery system including construction and startup.

Confidential Client, Parma, OH. Design manager for surface water collection system at oil impacted storage area at an operating facility.

Industrial / Manufacturing Sites, New Jersey. Provided senior technical review, design management, contractor qualification and selection, review of technical proposals. Reviewed and coordinated process selection, equipment selection and procurement for multiphase extraction, metals treatment, thermal oxidizer and related treatment systems for two sites with chlorinated solvents and toluene.

Leachate Treatment, Defiance, OH. Senior technical review for design and construction of treatment system for PCB-impacted groundwater leachate recovery system.

DNAPL Recovery System, Vandalia, OH. Senior technical review for upgrades at deployment of DNAPL recovery system. System is housed in a portable trailer and includes pumping system, DNAPL/water separator and groundwater treatment by regenerable resin.

Brownfield Redevelopment, Detroit, MI. Project manager for focused feasibility study and bench testing for interim measures at a site combining former industrial occupancy and MGP waste. Evaluated measures include bioremediation of dissolved plumes, capture of LNAPL and DNAPL and in-situ stabilization of coal tar impacted soils by deep soil mixing.

Brownfield Redevelopment, Former Landfill, Utica, MI. Project manager for investigation of methane gas and impact on proposed redevelopment. Project included coordination of geotechnical investigation as well as estimates for gas control measures.

Acid Vault Closure, Warren, MI. Project manager for closure of spent acid vault. Project was fast-tracked due to discovery of the vault containing acid and metals during a property transaction and required coordination of multiple parties and contractors.

System Decommissioning, Atlanta, GA. Project manager for turnkey decommissioning of closed remediation site consisting of over 40 wells and associated piping, pumps, vacuum extraction and controls, located interior and exterior of an operating facility.

Former Refinery, Confidential Client. Project design manager for design and implementation of approximately 34-acre geosynthetic cover system, groundwater capture, treatment for benzene, toluene, ethylbenzene and xylenes (BTEX) and inorganics and free-product recovery at the site of a former refinery. Project included review of alternative systems, detailed cost and constructability analysis, coordination of bids and technical review of contractor and vendor bids. Project manager for construction phase engineering support including permitting, value engineering and construction monitoring.

Confidential Client, Connecticut. Senior technical reviewer for multiple-acre methane recovery system for a new facility being constructed over a historical uncontrolled fill over facility included high rise offices, labs and parking structures.

Electric Beam Pilot Study, Orange County, Water District, California. Project engineer for pilot test that successfully demonstrated destruction of chlorinated solvents methyl tert-butyl ether (MTBE) and other contaminants in well water and waste water. Pilot study utilized a mobile truck unit developed by HVEA.

Xerox, Oak Brook, IL. Project manager for implementation of an Illinois Environmental Protection Agency (EPA)-approved Closure Plan. The development of this program included strategic replanning, revisions to the Corrective Measures Study negotiation of risk-based cleanup objectives, budgeting and implementation of targeted excavation areas, *ex situ* treatment, and replacement of 9,000 cubic yards of soils contaminated with chlorinated solvents near and beneath existing structures. Prior to implementing the Closure Plan, Mr. Hardison coordinated design and implementation activities for three 2-PHASE Extraction and associated treatment systems at the site. Programs to remove former underground solvent piping systems were also implemented under critical time requirements for Xerox. Mr. Hardison has served as project manager for all aspects of this project, including post-closure monitoring and Closure Certification submissions to Illinois EPA.

Xerox, Building 801, Henrietta, NY. Project manager for remediation program including feasibility study, remedial design and remedial action. Responsible for program planning with Xerox project manager of annual budgets. Corrective Measures Study assessed technical and economic benefits of excavation, in-situ and ex-situ remediation approaches. Provided design team coordination, construction administration and ongoing remediation optimization for the selected in-situ vacuum extraction system.

Xerox Building 201/206/218, Webster, NY. Project manager for site remediation, including strategic planning, CMS revisions, cost estimate, design and implementation. Project includes migration-control of impacted groundwater in bedrock and remediation of source areas using dual-phase extraction technology and blasted bedrock zones. Contaminants include trichloroethene (TCE), trichloroethane (TCA), and tetrachloroethene (PCE).

Confidential Client, Michigan. Coordinated feasibility studies and corrective measures studies for a portfolio of manufacturing sites, design and implementation of interim remedial measures as turnkey projects, reserve analysis and transaction scenario planning.

Landfill, New York, Leachate Collection System. Project engineer for design of leachate collection and storage system for landfill expansion cells. Design included engineering and specifications for pumps, piping and tanks.

Manufacturing, Confidential Client. Project engineer for feasibility study to evaluate alternatives to reduce solids and control pH in facility discharges. Alternative considered included both source and point-of-compliance measures. Project manager for design estimates, and staged implementation program for selected measures.

Industrial Facility, Confidential Client, Columbus, OH. Project engineer for replacement of process underground storage tanks (USTs). Coordinated design concepts and construction costs with facility engineering including HAZ-OP review. Design included 3 UST's ranging from 12,000 to 10,000 gallons, truck unloading facility, transfer pumps and transfer piping as well as inventory control and monitoring system. Developed detailed design, provided construction technical support and developed startup/O&M procedures to construct and commission tanks during plant operations.

Industrial Facility, Confidential Client, Columbus, OH. Project engineer for evaluation of alternatives for replacement of process USTs. Coordinated design concepts and construction costs with contractor. Design included 12 UST's ranging from 30,000 to 12,000 gallons, truck and railcar unloading facility, transfer pumps and transfer piping as well as inventory control and monitoring system. Developed detailed design, provided construction technical support and developed startup/O&M procedures to construct and commission tanks during plant operations as part of design/build team.

Industrial Facility, Confidential Client, Sanborn, NY. Project engineer for preparation of conceptual design, estimate and design/build request for proposal for an approximately 14-acre site impacted by chlorinated solvents. Provided technical review of bidders, design and third party quality control during construction and startup.

New Hanover County Steam Plant Expansion, Wilmington, NC. Project engineer for preliminary plant layout equipment specification and piping for 250 tons per day municipal solid waste incineration/cogeneration expansion. Equipment included materials handling systems, tanks, water treatment, dust/ fume treatment, pumps and stack.

NASA, Huntsville, AL. Project manager for upgrade of facilities for new research and development use. Work included high pressure gases, clean room, computer rooms and radiation shielding for an environmental effects laboratory.

KEITH M. ARAGONA, P.E.

Senior Project Manager

Education
The University of Michigan, M.S. Mechanical Engineering, 2009
North Carolina State University, M.S. Civil Engineering, 1999
West Virginia University, B.S. Civil/Environmental Engineering, Magna Cum Laude, 1997

Professional Registration
Michigan: Professional Engineer (Reg. No. 6201053743)
1998/North Carolina: Engineer-in-Training

Professional Societies
American Society of Civil Engineers, Member
American Society of Mechanical Engineers, Member
Project Management Institute, Member

Since joining Haley & Aldrich, Mr. Aragona has managed and completed projects involving environmental construction, demolition, soil and groundwater remediation and assessment, groundwater flow modeling, and environmental site assessments. His project experience and responsibilities include managing all aspects of engineering design, bidding, and construction management for a variety of environmental remediation systems and building demolition, operations and maintenance of remediation systems, engineering and construction cost estimating, strategic planning, evaluating remediation alternatives, and contract writing.

Relevant Project Experience

Petroleum, Former Manufacturing Facility, Hastings-on-Hudson, NY. Engineer responsible for managing and completing multiple high profile projects at the site. All field work has been completed without lost time safety incidents.

Demolition of 10 buildings: Project engineer and project manager responsible for developing construction drawings and specifications for a fast-tracked demolition project. Responsibilities included review of site historical data, site walk, completion of bid drawings and specifications, engineering cost estimate, and recommendations to client for contractor selection. Construction manager for the decommissioning and demolition of 10 buildings of various construction using New York City union labor. Project tasks included managing field staff, air monitoring, erosion control, building decommissioning (including removal of hazardous materials, transformers, biohazards, and other waste materials that required special handling), asbestos abatement, building demolition, waste profiling, construction material segregation, use of barges to receive large construction equipment and field offices, use of barges to remove scrap steel from the site. Challenges that were faced and overcome during execution of field activities include the proximity of the work site to a commuter passenger train platform and tracks (within 30 - 50 feet), obtaining permits to complete work adjacent to the railroad, completing an asbestos abatement using two shifts, geotechnical evaluations to determine the stability of the shoreline during steel staging activities, and weekly site walks by city officials. Approximately 34,000 man hours were used to complete this $5.1M project without a lost time safety incident.

DNAPL remediation feasibility evaluation and pilot test: Engineer responsible for evaluating technologies to remediate a viscous dense non-aqueous phase liquid (DNAPL) containing 40% polychlorinated biphenyls (PCBs) located 35 feet below ground surface that increases in viscosity with the addition of heat. Challenges included the presence of a timber pile field, DNAPL located beneath the Hudson River, and rip rap located on the shoreline. Evaluated technologies included directionally drilled wells, a large diameter caisson with horizontal wells, and a vertical well network (chosen technology). Also responsible for operations of the chosen technology.

DNAPL remediation system: Engineer responsible for designing and implementing the remedial design for removal of DNAPL from the subsurface. Key challenges included determining, while installing recovery wells, the DNAPL is not continuous, resulting in field decisions to place the wells; presence of a previously unknown wooden bulkhead that may be contributing to preventing further migration of DNAPL; and installation of large diameter wells on an angle in order to access DNAPL located off shore.

Evaluation of historic building: Engineer responsible for managing the engineering evaluation and cost benefit analysis of preserving a politically charged building (built in 1908) located on the site. The process included evaluating the roof, columns, and floor to determine remedial effort required to bring the building back into service for several different potential future uses.

Site operations and maintenance: Engineer responsible for evaluating the site on a continual basis to determine health and safety, security, and housekeeping maintenance items that are required to be addressed.

Tier 2 Automotive Parts Supplier, Manufacturing Facility, Flint, MI. Engineer responsible for an interim measure remediation of DNAPL-impacted soils via excavation. Responsibilities included designing the remedial action, managing contractors' bids, completing contract documents (technical specifications), engineering support during construction, reporting, and overall project budget and schedule. Key aspects of the project included dewatering, removing subsurface obstructions, protecting an adjacent roadway during the excavation via sheet pile and anchor shoring, roadway integrity monitoring through daily surveys, ambient air monitoring, excavating DNAPL-impacted soils to 15 feet below ground surface, hazardous waste soils management, installing bioamendment, and excavating backfill and compaction.

Also responsible for an interim measure groundwater extraction system design and installation. Responsibilities included designing the remedial action, managing the remedial design, completing contract documents (technical specifications), managing contractors' bids, negotiating a discharge location with the City, engineering support during construction, reporting, and overall project budget and schedule. Key aspects included installing 9,600 feet of 2-in high density polyethylene (HDPE) groundwater transfer piping containing a 12-in secondary containment pipe laid on grade; groundwater treatment via air stripping; iron sequestering agent injection; exterior treatment enclosure construction; site civil, electrical, and instrumentation; remote monitoring; building security; and extending public utilities to the newly installed building. Responsible for ongoing operations and maintenance of the system.

Tier 2 Automotive Parts Supplier, Manufacturing Facility, Grand Rapids, MI. Engineer responsible for an interim measure storm water retention basin closure via excavation of contaminated sediments and then backfilling. Responsibilities included designing portions of the remedial action, managing portions of the remedial design, completing contract documents (technical specifications), managing contractors' bids, engineering support during construction, reporting, and overall project budget and schedule. Key aspects of the project included dewatering a 1-acre area, adjacent structure integrity monitoring through daily surveys, mixing sediments with a stabilizing agent, removal of contaminated sediments, and backfill and compaction of the basin.

Responsible for an interim measure groundwater extraction system design and installation. Responsibilities included managing the design, managing contractors' bids, completing contract documents (technical specifications), engineering support during construction, reporting, and overall project budget and schedule. Key aspects of the project included pumping well installation, installing utilities and groundwater transfer and discharge piping via directional drilling, designing and constructing a permanent enclosure, motor control panel, and electrical service.

Responsible for completing a post closure care plan for a former hazardous waste storage area and a Corrective Measures proposal for the site. Evaluated several types of remedial technologies in order to choose the most effective and cost-effective technology to complete remedial activities at various areas of interest on site.

Former Manufacturing Facility, Superfund Site, Bronson, MI. Engineer for a remedial investigation to determine the nature and extent of subsurface impacts at a former manufacturing site impacted with DNAPL. Responsibilities included completing the remedial investigation work plan; managing field staff during three phases of investigation; procuring project subcontractors; monitoring the progress and quality of soil, gas, and groundwater sample collection; completing remediation alternatives assessment and associated costs of DNAPL-impacted soil and groundwater on the site; quarterly updates to environmental reserve estimates; preparing and reviewing interim monitoring reports; and providing technical support of project activities.

Engineer responsible for completing a CERCLA feasibility study to evaluate applicable remediation technologies and capital and long-term operating costs.

Telecommunications Facility, Manufacturing Facility, Omaha, NE. Engineer responsible for an interim measure remediation of DNAPL-impacted groundwater slurry wall and permeable reactive barrier (PRB). Responsibilities included designing the remedial action, completing contract documents (technical specifications), managing contractors' bids, and limited oversight during construction. Key aspects of the project included designing the zero valent iron PRB and slurry cutoff wall, installing the soil/bentonite slurry wall to 55 feet below ground surface under slurry, installing the PRB, and installing monitoring wells. Responsible for ongoing groundwater sampling and operations and maintenance of the PRB.

Tier 2 Automotive Parts Supplier, Former Manufacturing Facility, Dayton, OH. Engineer overseeing construction activities required to remove various underground storage tanks (USTs), including five State-regulated USTs and one Resource Conservation and Recovery Act (RCRA) Hazardous Waste UST located in a vault in the basement of a former manufacturing facility, a RCRA Hazardous Waste above ground storage tank, and a RCRA Hazardous Waste Collection Sump. Responsibilities included construction and excavation supervision, compacted fill placement, in-situ density testing, performance analysis, health and safety monitoring and development, and report preparation.

Tier 2 Automotive Parts Supplier, Manufacturing Facility, Fayette, OH. Emergency response to a free product spill at the facility to their storm water sewer system and to a creek located south of the facility. Performed a facility-wide Phase II subsurface investigation to determine the nature and extent of PCB, volatile organic compound (VOC), metals, and semi-VOC impact to the subsurface at the facility, and removed impacted soil and free product from a portion of the facility. Responsibilities included designing and executing a subsurface investigation, remediation design, completing contract documents (technical specifications), managing contractors' bids, managing field staff, engineering support during construction, reporting, and overall project budget and schedule. Key aspects of the project included storm sewer cleaning, excavating impacted soils inside a building and adjacent to its foundation, and reconstructing the facility's chip handling area.

Former Police Barracks, Tier 2 Automotive Parts Suppliers, Various Facilities, Flint, Grand Rapids, and Mount Pleasant, MI. Completed audits to determine the effectiveness and efficiency of existing free product collection and groundwater recovery and treatment systems. Made recommendations for treatment system upgrades and equipment replacement to increase cost efficiencies of the systems, and evaluated and recommended alternative strategies to achieve long-term remediation goals.

Tier 2 Automotive Parts Supplier, Howell, MI. Completed an Integrated Contingency Plan (ICP) for use at the facility and distribution to the Michigan Department of Environmental Quality (MDEQ), fire and police departments, and the Local Emergency Planning Committee. The ICP complies with requirements listed in the RCRA; State of Michigan Hazardous Waste Management Act; Clean Water Act (Spill Prevention Control and Countermeasure [SPCC] Plan); MDEQ Water Division (Pollution Incident Prevention Plan and Spillage of Oil and Polluting Materials); Occupational Safety and Health Administration; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Emergency Planning and Community Right-to-Know Act; Toxic Substance Control Act; Clean Air Act; Michigan Clean Air Act; Michigan Environmental Response Act; and Department of Transportation Hazardous Materials Transportation Act.

Steel Processing Center and Various Tier 2 Automotive Parts Suppliers, Multiple Locations in Michigan. Completed SPCC Plans for use at facilities. The SPCC Plans comply with requirements listed in the Clean Water Act (SPCC Plan) and the MDEQ Water Division (Pollution Incident Prevention Plan and Spillage of Oil and Polluting Materials).

Tier 2 Automotive Parts Supplier, Anaheim, CA. Engineer responsible for the design of a soil vapor extraction system. Responsibilities included completing the engineering design for agency approval.

City of Sandusky, Sandusky, OH. Engineer responsible for construction oversight during the installation of a forced water main. Responsibilities included supervising trench excavation and compaction, pipe placement, and report writing.

City of Kent, Kent, OH. Engineer responsible for delineating petroleum-impacted soil during the installation of a storm water sewer. Impacted soil was shipped to a hazardous waste landfill.

NAV-TECH Industries, Cleveland, OH. Performed a test pit program at the site to support an Ohio Voluntary Action Program site closure. The test pit program also supported the determination of whether NAV-TECH was eligible to apply for State, county, and/or city funding to pay for subsequent subsurface investigations and remediation prior to development.

Risk Assessment, Various Clients, Ohio. Risk assessor responsible for developing site-specific cleanup levels for a manufacturing facility and a city property. Site-specific information was used to modify fate and transport models and exposure scenarios to develop cleanup levels.

Groundwater Modeling and Visualization

Confidential Client, Manufacturing Facility, Wheatfield, NY. Completed a groundwater flow model describing groundwater flow in fractured bedrock with four distinct horizontal flow zones. The model predicted groundwater capture and volume of water removed for a migration control system. The purpose of the model was to conceptualize the effectiveness of various groundwater migration control systems.

3-Dimensional Environmental Site Visualization. Engineer responsible for developing quantitative, animated 3-dimensional models for several industrial sites. Modeling included using 3-dimensional geostatistical methods to develop animated presentations showing the relationship among regional geology, hydrogeology, site features, extent of product, and the co-mingling contaminant plumes.

Environmental Site Assessments (ESA)

Performed ESAs for commercial and industrial properties for various types of clients at locations within the United States. ESAs were completed in accordance with standards established by the American Society for Testing and Materials, Environmental Site Assessments, E 1527-00. These studies involved in-depth background research, including reviewing historical and current aerial photographs, evaluating UST registrations, reviewing State and Federal databases, site inspections, and surrounding property usage evaluation.

Research

North Carolina State University, Laboratory Research, Raleigh, NC. Performed a subsurface investigation, and designed and performed laboratory tests to estimate soil, contaminant, and surfactant adsorption and desorption parameters required to remediate a radioactive and DNAPL impacted industrial property located in Ashtabula, Ohio.

DENIS M. CONLEY

Senior Scientist

Over 20 Years of experience in the investigation, and remediation of industrial properties throughout the US and the world.

Education

University of Southern Maine, B.A. Biology, 1982
University of Southern Maine, B.S. Applied Chemistry, 1986

Professional Registration

1989/Certified Bacteriologist, Maine
1991/ Certified Data Validator, New York

Professional Societies

ASTM E50.02 - Vapor Intrusion Task Group, 2006
NYWEA –Seminar Committee, 2002-Present

Special Studies and Courses

OSHA 40 Hr. (29 CFR 1910.120), 1991

8 Hr. Refresher (29 CFR 1910.120), 1992-2008

24-Hour OSHA Supervisor Training (29 CFR 1910.124), 1994

Water Treatment Process Chemistry, University of New Hampshire, 1989

Comprehensive Industrial Hygiene, University of Michigan, 1995

Mr. Conley serves as a Project Manager and Quality Assurance Officer within Haley & Aldrich and sits in our Rochester, NY office. He has more than 20 years of diversified experience in the investigation, evaluation, and implementation of remedial technologies including enhanced bioremediation, multi-phase extraction, and *in situ* thermal remediation. Mr. Conley has managed projects throughout the United States, Great Britain, the Middle East, and South Pacific.

Projects have included hydrogeologic investigations under State-sanctioned Voluntary Cleanup Programs, Federal corrective actions and emergency response orders, and the preparation of Corrective Measure and Feasibility Studies. Mr. Conley has experience in the remediation of surface and subsurface soils and groundwater impacted with chlorinated solvents, herbicides and pesticides, polychlorinated biphenyls (PCBs), dioxins/ furans, and coal tar.

Mr. Conley has served as adjunct faculty with the Rochester Institute of Technology's Department of Chemistry in Rochester, New York conducting courses in environmental chemistry for undergraduate and graduate students.

Relevant Project Experience

Quality Assurance Officer (QAO) Remedial Design/Remedial Action, Federal Superfund Site, Eastern Massachusetts. Responsible of all QA activities to support additional studies for the development of an RD/RA for a federal Superfund site under a Record of Decision issued by USEPA Region 1.

Quality Assurance Officer (QAO) Remedial Investigation/Feasibility Study, Federal Superfund Site, Central Ohio. Prepared Sampling and Analysis Plans (SAP), and Quality Assurance Project Plans (QAPP) with PRP group staff in the execution of an emergency response order under USEPA Region 5 oversight.

Quality Assurance Officer (QAO) Remedial Investigation/Feasibility Study, Federal Superfund Site, Southwestern Michigan. Prepared Sampling and Analysis Plans (SAP), and Quality Assurance Project Plans (QAPP) in the execution of an emergency response order under USEPA Region 5 oversight.

Rocky Mountain Arsenal (RMA) Wildlife Refuge. Denver, Colorado, Prepared work plans and Quality Assurance documents for approval by State and Federal stakeholders including the USEPA, CDOH, ACOE and ATSDR for the remediation of pesticide impacted soils and groundwater in the Central Remediation Area (CRA).

General Motors Corporation, RCRA Facility Investigations, Continental U.S. and Mexico. Prepared Sampling and Analysis Plans (SAP), Quality Assurance Project Plans (QAPP) with GM-Environmental Services staff in the execution of Streamlined Corrective Action orders with USEPA Region 5.

Eastman Kodak Company, Facility Reference Document, Rochester, NY. Developed a site-wide Quality Assurance Project Plan (QAPP) for the Kodak Park facility. The QAPP is utilized as a guidance document for the preparation of work plans conducted at the facility for NYSDEC interim remedial measures (IRM), RCRA Facility Investigations (RFI), and CERCLA Remedial Investigation/Feasibility Studies under USEPA Region 2.

Xerox Corporation, Corrective Measures Study (CMS), Worldwide Manufacturing facility, Webster, NY. Project Manager and primary author of the CMS for a large multi-building manufacturing facility located in upstate New York.

Major Oil Company Refinery Complex, Lake Charles, LA. Installation and operation of a groundwater recovery system for free phase ethylene dichloride (EDC) at an active industrial facility in Lake Charles, Louisiana. The recovery system utilizes carbonaceous and polymeric resins to adsorb EDC for recycling and re-use.

Facility Decontamination and Restoration, Israel Electric Corporation, Ashdod, Israel. Quality Assurance oversight for insurance representatives during the decontamination and restoration of a 200,000-sq-ft electric power generation station following a PCB transformer fire. Decontamination was performed in accordance with procedures promulgated under 40 CFR Part 761 by the USEPA Office of Pollution Prevention and Toxics.

Feasibility Study, State Superfund Site, Western New York. Prepared the final Feasibility Study for a Class 2 Hazardous Waste Site located in Western New York. The site soils and groundwater have been impacted with chlorinated solvents and process materials from an active manufacturing facility.

TSCA National Permit Demonstration, Federal Superfund Site, Missouri Electric Works, Cape Girardeau, MO. Responsible for an equivalency demonstration using the TerraTherm In-Situ Thermal Desorption (ISTD) process for remediation of PCBs from overburden soils. The demonstration findings were used to develop a Nationwide Permit for PCB Treatment from the USEPA Office of Pollution Prevention and Toxics (OPPT).

Soil Remediation, Island of Saipan, Commonwealth Northern Marianas Islands. Applied the patented ISTD technology on the island of Saipan for the treatment of soils impacted with PCBs.

Presentations and Papers

"ASTM E2600 Standard – Assessment of Vapor Intrusion in Real Estate Transactions", Rochester Engineering Society Symposium, Rochester, New York, 2008.

"Observed Attenuation Factors (AF) from Soil Vapor Intrusion Investigations (SVI) at Industrial Facilities in New York State", Midwestern States Risk Assessment Symposium, Indianapolis, IN, 2006.

"Self-Seeding Indigenous Microorganisms for the Treatment of MTBE-impacted Groundwater", presented at the 8^{th} International Symposium for In-Situ and On-Site Bioremediation, Battelle Memorial Institute, 2005.

"Enhanced Bioremediation of 1,1,1-Trichloroethane: Multiple Site Review", presented at the 7th International Symposium for In-Situ and On-Site Bioremediation, Battelle Memorial Institute, 2003.

"Field Demonstration of Thermally Enhanced Multi-phase Extraction," with J. Savarese, S. Gupta, and R. Baker, presented at the 3rd International Conference on the Remediation of Recalcitrant and Chlorinated Compounds, Battelle Memorial Institute, Monterey, CA, 2002.

"Field Scale Implementation of Thermal Well Technology, Naval Facility Centerville Beach, Ferndale, California," presented at the 2nd International Conference on the Remediation of Recalcitrant and Chlorinated Compounds, Battelle Memorial Institute, Monterey, CA, 2000.

"In Situ Thermal Desorption of Refined Petroleum Hydrocarbons from Saturated Soils," with K.S. Hansen, G.L. Stegemeier, presented at Battelle Memorial Institute Conference, Monterey, CA, 2000.

"ISTD Treatability Study at Rocky Mountain Arsenal Hex Pit," with R.S. Baker, J. Galligan, D. Gregory, P. Patton, and S. Hall, proceedings of the 2nd International Conference on the Remediation of Recalcitrant and Chlorinated Compounds, Battelle Memorial Institute, Monterey CA, 2000.

"Application of ISTD Thermal Well Technology - Case Study," presented at the 1st International Environmental Exposition, Interstate Technology Regulatory Cooperation (ITRC) Workgroup, Atlantic City, NJ, 1999.

"*In situ* Thermal Desorption of Coal Tar," with Kirk S. Hansen, H. J. Vinegar, and G. L. Stegemeier, *proceedings from the* 11th International Symposium, Institute of Gas Technology, Orlando, FL, 1998.

"In Situ Thermal Desorption of PCBs," with H. J. Vinegar, G. L Stegemeier, and J.M. Hirsch, et al, *proceedings of the* Superfund XVIII Conference, Washington, DC, 1997.

"Applied Groundwater Treatment using UV Oxidation Technologies," with J.E. Loney, presented at the 28th Mid-Atlantic Industrial and Hazardous Waste Conference, Buffalo, NY, 1996.

"Surfactant Applications in Environmental Restoration," with D.A. Edwards, and M.G. Biekirch, proceedings of the 28th Mid-Atlantic Industrial and Hazardous Waste Conference, Buffalo, NY, 1996.

AMANDA COVER
Quality Assurance Chemist

FIELDS OF COMPETENCE

- Volatile and semivolatile organic data (generated by GC and GC/MS analyses) validation.
- Pesticides and PCB Aroclor data validation.
- Inorganic and wet chemistry data validation.
- Performance Evaluation Studies.

CREDENTIALS

B.S., Environmental Science, Albright College, Reading, Pennsylvania, 2006.

PROFESSIONAL DEVELOPMENT COURSES

Multi-Agency Radiology Laboratory Analytical Protocols Manual; Part 1 Training; "The MARLAP Process", United States Environmental Protection Agency, Region 3 Philadelphia, Pennsylvania, August 2009.

SUMMARY OF EXPERIENCE

Ms. Cover, who joined the Chemistry Quality Assurance Department in 2009, is responsible for analytical data validation to determine environmental data quality and usability. She is also responsible for the evaluation of laboratory data deliverables relative to regulatory and client-specific requirements. Data reviewed are generated by US EPA Contract Laboratory Program (CLP) Protocols and SW-846 Methods.

She was previously employed at an environmental laboratory where she served as an analytical chemist and Health and Safety Officer. In the Wet Chemistry Department, she analyzed samples for hexavalent chromium, sulfide, hardness, alkalinity, and total organic carbon and performed several other analyses. She was also responsible for screening samples for radioactivity prior to laboratory-wide handling of the samples.

Ms. Cover performed research in the environmental science discipline. She assisted with a baseline water-quality study for a restoration project in Reading, Pennsylvania, to evaluate the success of the restoration. In addition, she researched nutrient loadings effects on aquatic organisms and water quality in Angelica Creek and the Schuylkill River.

KEY PROJECT

- Serves as a data verification chemist for a project involving a utility company fly ash spill in Eastern Tennessee. Verifies the consistency of data between electronic and limited hardcopy deliverables from several participating laboratories.
- Performed analytical data validation interpreting volatile organic, semivolatile organic, inorganic, and wet chemistry analyses and prepared technical quality assurance reports.
- Provided data validation services for projects to determine usability and defensibility of data as well as laboratory compliance with project-specific requirements.
- Verified analytical results from electronic data deliverables (EDDs) and database output during validation tasks
- Coordinated and reviewed double-blind performance evaluation studies as part of quality monitoring activities for a corporate laboratory program.
- Performed senior-level review of data validation reports.

PRESENTATION/PAPERS

Cover, A. "Primary Production in Angelica Creek and the Schuylkill River." Undergraduate Science Research Paper, May 2006.

JENNIFER N. GABLE
Senior Quality Assurance Chemist II

FIELDS OF COMPETENCE

- Corporate laboratory program design, execution, and maintenance.
- Quality assurance oversight for environmental investigatory and remedial projects.
- Project management.
- Laboratory auditing.
- Quality assurance project plan preparation.
- Performance evaluation study design, execution, and statistical review.
- Analytical request for proposal preparation and proposal review and evaluation.
- Analytical and environmental chemistry consulting.
- Data validation.

CREDENTIALS

Graduate coursework toward M.S. Chemistry Degree at Villanova University, Pennsylvania.

B.S., Chemistry, Bloomsburg University, Bloomsburg, Pennsylvania, 2002.

SUMMARY OF EXPERIENCE

Ms. Gable has 7 years of analytical quality assurance experience at Environmental Standards. As a Senior Quality Assurance Chemist, she has performed project management duties for several projects of varying size and scope. Ms. Gable serves as the QA Oversight Project Manager for three national Environmental Contract Laboratory Programs and coordinates discrete and ongoing quality monitoring activities including laboratory auditing, performance evaluation studies, and data validation. In addition, Ms. Gable serves as the technical reference point for the laboratory programs. She has assisted several clients in preparing technical requests for proposal for environmental laboratory services and in selecting appropriate laboratories to meet their specific requirements. Ms. Gable has developed quality assurance project plans for several projects encompassing various sample matrices and analytical parameters. In addition, Ms. Gable has assisted in the coordination and implementation of quality assurance programs for projects of varied size and scope. Ms. Gable has conducted numerous on-site audits of environmental laboratories ranging from small wastewater facilities to large, full-service environmental and industrial hygiene laboratories. She is experienced in validation of data to determine analytical data quality and usability. Data reviewed include those for air, soil/sediment, aqueous, and biological tissue samples analyzed in accordance with US EPA Contract Laboratory Protocols (CLP) and SW-846 Methods.

KEY PROJECTS

- Coordinated interdepartmental efforts to develop and implement quality assurance programs for projects of varied size and scope, including investigatory projects involving release of fly ash into terrestrial and aquatic environments.
- Designed and executed an environmental corporate laboratory program encompassing \$3 to \$4 million in annual analytical expenditures. Responsibilities include preparation of the Technical Specifications Manual and Request for Proposal; review and scoring proposals from eight major national environmental laboratories; and coordination of the laboratory program rollout meeting.
- Serve as Project Manager for national contract laboratory programs. Serves as QA oversight manager and coordinates discrete and ongoing quality monitoring activities including laboratory auditing, performance evaluation studies, and periodic data validation. Also serves as primary contact for the programs' Help Desks.

ENVIRONMENTAL® STANDARDS

KEY PROJECTS (Cont.)

- Served as Project Manager for several projects of varying size and scope. Served as a consulting chemist and on-site quality assurance oversight representative. Coordinated the efforts of staff chemists to perform validation of organic and inorganic analytical data and to prepare technical quality assurance reports; communicated with clients regarding validation issues.
- Audited organic, inorganic, wet chemistry, and industrial hygiene parameters at several environmental laboratories to evaluate compliance with laboratory standard operating procedures, good laboratory practice, and client-specific or project-specific requirements.
- Planned and executed single-blind and double-blind performance evaluation studies as part of quality monitoring activities for several corporate laboratory programs and on a project-specific basis.
- Prepared Technical Specifications Manuals for several Environmental Corporate Laboratory Programs.
- Developed laboratory requests for proposal for submission to several laboratories as part of a corporate laboratory program re-bid for a major energy corporation.
- Managed and performed senior-level review for data validation projects.
- Performed analytical data validation interpreting volatiles, semivolatiles, PCBs, inorganics, and wet chemistry analyses and developed technical quality assurance reports for projects of varying size and scope.

PRESENTATION/PAPERS

Rogers, W., R. J. Vitale, J. N. Gable, E. E. Rodgers, J. P. Kraycik, and N. E. Carriker. "Porewater Studies Subsequent to the Kingston Ash Event." World of Coal Ash Conference, Lexington, KY, April 2013.

Babyak, C., J. Gable, K. C. P. Lee, W. Rogers, R. J. Vitale, N. Carriker. "Multi-laboratory Comparison of Sequential Metals Extractions." Goldschmidt Conference, Montreal, Quebec, June 2012.

Vitale, R. J., J. Gable, E. Cowan, K. Seramur, W. Rogers, N. Carriker, C. Babyak. "Chemical, Optical and Magnetic Susceptibility Characterization of Coal Fly Ash." Goldschmidt Conference, Montreal, Quebec, June 2012.

Forman, R. L., R. J. Vitale, J. N. Gable. "Important Factors for Performing Percent Moisture Tests on Biological Matrices." Sediment Management Work Group (SMWG) Fall Sponsor Forum, Philadelphia, PA, October 2011.

Gable, J. N., R. L. Forman, R. J. Vitale. "Laboratory Selection During Emergency Response Actions – Balancing the Need for Quality Data With the Need for Quick Data." National Environmental Monitoring Conference (NEMC), Bellevue, WA, August 2011.

Vitale, R. J., R. L. Forman, J. N. Gable, E. E. Rodgers, *et. al.* "Implementation of a Field and Laboratory Quality Oversight Program During the TVA Kingston Fly Ash Recovery Project to Ensure High Quality and Defensible Data." TVA-Kingston Fly Ash Release Environmental Research Symposium, Harriman, TN, August 2-3, 2011.

PRESENTATION/PAPERS (Cont.)

Rogers, W. J., R J. Vitale, J. N. Gable, E. E. Rodgers, J. Gruzalski, and N. E. Carriker. "Observations of Metals and Metaloids in Sediment Porewater Associated with the Tennessee Valley Authority, Kingston, TN Ash Recovery." TVA-Kingston Fly Ash Release Environmental Research Symposium, Harriman, TN, August 2-3, 2011.

Gable, J. N. "Purchasing Analytical Services: Method Flexibility and the Need to Educate Analytical Buyers." East Tennessee Environmental Conference. Kingsport, TN. March 16-17, 2010.

Carriker, N., R. J. Vitale, R. L. Forman, and J. N. Gable. "Kingston Ash Release - Initial Water and Sediment Monitoring Response and Subsequent Refinements (Poster)." SETAC Annual Meeting, New Orleans, LA, 2009.

Vitale, R.J. and Gable, J. "Laboratory MDL Verification Studies – No Guidance and No Rules for Defining Detection." TCEQ 2008. Austin, TX, April 2008.

Schott (Gable), J. N., S. T. Zeiner, D. R. Blye, and D. J. Lancaster. "Evaluating Calibration Model Reliability." The 20th Annual National Environmental Monitoring Conference, Washington, DC. July 19-23, 2004.

Kristina Harsh
Quality Assurance Chemist

FIELDS OF COMPETENCE

- Volatile and semivolatile organic data (generated by GC and GC/MS analyses) validation.
- Inorganic data validation.
- Laboratory coordination.

CREDENTIALS

B.S., Chemistry, West Virginia University, Morgantown, West Virginia, 2008.

B.S., Forensic and Investigative Science with emphasis in Chemistry, West Virginia University, Morgantown, West Virginia, 2008.

SUMMARY OF EXPERIENCE

Ms. Harsh, who joined the Chemistry Quality Assurance Department in 2010, has 2 years of analytical chemistry laboratory experience. She is responsible for determining environmental data usability and quality though data validation. Guided by regulatory and client-specific requirements, she evaluates laboratory data deliverables. The data reviewed are generated by the US EPA Contract Laboratory Program (CLP) protocols and SW-846 Methods. Ms. Harsh also coordinates the efforts of several laboratories for a major pipeline company, including coordinating the field sampling events, and delivery of bottleware from the laboratories to the field. She ensures that the laboratory provides proper deliverables according to client specifications.

Before joining Environmental Standards, she was employed at a pharmaceutical contract laboratory where she focused on finished product testing. Her responsibilities included HPLC, UV, dissolution, Karl Fischer, osmolality, and physical tests. She also held a laboratory assistant position in which she was responsible for preparing reagents and unknowns for the student organic chemistry laboratories.

KEY PROJECTS

- Performed analytical data validation interpreting organic, inorganic, and general chemistry analyses and prepared technical quality assurance reports.
- Coordinates sampling and delivery of bottleware kits to the field for a large pipeline company. Verifies proper deliverables by the laboratory to the client. Also, provides chemistry communication between the laboratory and the client.

PRESENTATION/PAPERS

"Direct Injection Mass Spectrometric Confirmation of Multiple Drugs in Overdose Cases from Postmortem Blood Using Electrospray Ionization-Tandem Mass Spectrometry and MS^3. "Journal of Analytical Toxicology, Volume 32, Issue 8, Page: 709-714, 2008.

ALYSSA KRESS
Quality Assurance Chemist

FIELDS OF COMPETENCE

- Volatile and semivolatile organic data validation.

CREDENTIALS

B.S., Chemistry, Minor in French, Juniata College, Huntingdon, Pennsylvania, 2011.

SUMMARY OF EXPERIENCE

Ms. Kress joined the Chemistry Quality Assurance Department in 2011. She is responsible for analytical data validation to determine environmental data quality and usability for numerous project sites. Data reviewed include those for State of Alaska Department of Environmental Conservation (ADEC) Methods and SW-846 Methods. In addition, she evaluates laboratory data deliverables to determine compliance with method, regulatory, and client-specific requirements.

Prior to joining Environmental Standards, Ms. Kress was involved in numerous undergraduate chemistry research projects, including the analysis of silver coins using laser-induced breakdown spectroscopy; the analysis of chemical, biological, radiological, nuclear, and explosive materials by laser-induced breakdown spectroscopy; and the base-catalyzed reaction of *o*-phthaldialdehyde with malonic acid. She also has experience working in an industrial setting through a summer internship.

KEY PROJECTS

- Performed analytical data validation interpreting volatile and semivolatile organic compounds and prepared technical quality assurance reports.
- Provided data validation services for various projects to determine usability and defensibility of data as well as laboratory compliance with regulatory and project-specific requirements.

PRESENTATIONS

- Kress, A.M., K.M. Beiswenger, R.R. Hark, A.L. Miller, "A Preliminary Evaluation of Portable and Standoff Laser-Induced Breakdown Spectroscopy (LIBS) Units for the Identification of Hazardous Materials by First Responders." American Chemical Society National Meeting. Moscone Center, San Francisco, CA, March 21 - 25, 2010.
- Kress, A.M, R.R. Hark, "Synthesis of 1-indanone via the base-catalyzed condensation reaction of *o*-phthaldialdehyde with malonic acid." American Chemical Society National Meeting. Moscone Center, San Francisco, CA, March 21 - 25, 2010.
- Kress, A.M., R.R. Hark, L.J. East, J. Gonzalez, "Analysis of Silver Coins by Laser-induced Breakdown Spectroscopy (LIBS)." LIBS 2010. Doubletree Hotel, Memphis, TN, September 12 – 17, 2010.
- Kress, A.M., R.R Hark, L.J East, J. Gonzalez, "Analysis of Silver Coins by Laser-induced Breakdown Spectroscopy (LIBS) and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS)." American Chemical Society National Meeting. Anaheim Convention Center, Anaheim, CA, March 27 – 31, 2011.

STEVEN J. LENNON
Senior Quality Assurance Chemist I

FIELDS OF COMPETENCE

- Volatile and semivolatile organic data (generated by GC and GC/MS analyses) validation of data.
- Pesticide, herbicide, and PCB data validation.
- Explosives data validation.
- Dioxin data validation.
- Metals data validation.
- Laboratory auditing.
- Air sampling using viable and nonviable collection procedures.
- Surface sampling using tape, swab, and carpet check procedures.
- Indoor air quality investigations for chemical and biological contamination.
- Interpretation of indoor air quality data.
- Microbiological aseptic techniques: clean room protocol; filling of containers with sterile cell culture media; and preparation of liquid media from dry powder components.
- Working knowledge of the following instruments, autosamplers, and data processing software:
  - OI Analytical 4560 and Tekmar purge and trap sample concentrators;
  - Hewlett Packard GC/MS (mass spec. models: 5970-5973);
  - OI Analytical Archon autosampler, OI Analytical 4551 autosampler, Hewlett Packard DMP-16; and
  - RTE-A, Target, Hewlett Packard Chemstation, and Enviroquant.

CREDENTIALS

B.S., Environmental Biology/Marine Biology, Millersville University, Millersville, Pennsylvania, 1994.

Professional Development Course: Microorganisms in Indoor Air-Health Complaints, Sampling Strategies & Interpretation, AIHA Conference, 2002.

Inspection, Testing, and Assessment of Microbial Contaminated Buildings – An Overview, National Asbestos and Environmental Training Institute (Herman Sabath), 2002.

Gas Chromatography and Mass Spectral Training, MDL Systems Inc. (Mark A. Ferry), 1999.

Archon Autosampler Training Course, Professional Technical Services, Ltd. (Scott Wolsing), 1997.

4460A & 4560 Concentrator Training, OI Analytical, 1995.

Basic 49 CFR Training Course, Hazardous Materials.com (Roy S. Marshall), 2003.

CERTIFICATIONS

Certified Residential Mold Inspector – Indoor Environmental Standards Organization, Minneapolis, MN.

PROFESSIONAL AFFILIATIONS

Indoor Environmental Standards Organization (IESO) – Member

American Indoor Air Quality Council (AmIAQ) – Member

SUMMARY OF EXPERIENCE

Mr. Lennon has 14 years of experience in the field of analytical environmental chemistry; this experience includes performing instrumental analyses for volatile organic compounds according to US EPA methodology. Mr. Lennon is currently responsible for performing analytical data validation to determine data quality/usability and compliance with regulatory and client-specific deliverable requirements.

An experienced indoor air quality investigator, Mr. Lennon is responsible for sample collection design, sample collection using a variety of methods visual inspection of buildings, and interpretation of laboratory results.

Prior to joining Environmental Standards, Mr. Lennon was an environmental chemist for a large analytical laboratory. He was responsible for GC/MS analysis of solid and aqueous samples in accordance with US EPA methods (e.g., 8260B, 524.2, and OLM03.2). He was also responsible for instrument preventive maintenance and troubleshooting and maintaining the integrity of the computer systems. He demonstrated competence in various US EPA methods by completing quad studies (show reproducibility). He was also responsible for analyzing the performance evaluation studies for Method 524.2, Rev. 4.0 and performing method detection limit studies.

Mr. Lennon was also previously employed by a small biotechnology company as a production technician. He was responsible for the aseptic filling of bottles and bags with liquid cell culture media. He also facilitated the measuring and formulating of liquid media from dry powder chemical components.

KEY PROJECTS

- Performed analytical data validation for numerous site investigations to determine analytical data outliers and data quality/usability. Data reviewed included those for US EPA CLP protocols, SW-846 Methods, Methods for the Chemical Analysis of Water and Wastes, and US EPA Series 200 and 600 Methods.

- Served as Project Manager for an annual laboratory performance evaluation (PE) study conducted for a major client.

- Served as the primary contact between field sampling personnel and analytical laboratories receiving the samples collected for a site investigation conducted for a major client.
- Currently serves as a Data Validation Task Manager for the numerous site investigations conducted for a major client.

KAITLYN MAKARA
Quality Assurance Chemist

FIELDS OF COMPETENCE

- Volatile, pesticide/polychlorinated biphenyl (PCB), and semivolatile organic data validation.
- Inorganic and wet chemistry data validation.

CREDENTIALS

B.S., Chemistry, Arcadia University, Glenside, Pennsylvania, 2010.

SUMMARY OF EXPERIENCE

Ms. Makara, who joined the Quality Assurance Chemistry Department in 2010, is responsible for analytical data validation to determine environmental data quality and usability for numerous project sites. Data reviewed include those for US EPA Contract Laboratory Program (CLP) protocols and SW-846 Methods. In addition, she evaluates laboratory data deliverables to determine compliance with method, regulatory, and client-specific requirements.

Prior to her employment with Environmental Standards, Ms. Makara was involved in undergraduate chemistry research. Her research included using a genetic algorithm to optimize the potential energy surfaces of hydrogen chloride clusters to find their global minima where the most stable structures occur.

KEY PROJECTS

- Performed analytical data validation interpreting volatile organic, pesticide/PCB, semivolatile organic, inorganic, and wet chemistry analyses and prepared technical quality assurance reports.
- Provided data validation services for various projects to determine data usability and defensibility as well as laboratory compliance with method, regulatory, and project-specific requirements.

AMMIE L. MARTIN
Senior Quality Assurance Chemist

ENVIRONMENTAL STANDARDS

FIELDS OF COMPETENCE

- Organic data validation.
- Inorganic and wet chemistry data validation.
- Laboratory Auditing.
- Experience in operation, calibration, and maintenance of:
  - GC/ECD
  - GC FID
  - HPLC
  - IC

CREDENTIALS

B.S., Chemistry, Georgia Southern University, Statesboro, Georgia, 1999.

CERTIFICATION

OSHA 29 CFR 1910.120 24-hour HAZWOPER Training. Certification: March 2010, Updated through June 2012.

OSHA 40 CFR 265.16 Hazardous Waste Management Training. Certification: January 2010, Updated through April 2012.

OSHA 40 CFR 172.702 and 172.704 Hazardous Materials Management (DOT) Training. Certification: February 2010, Updated through February 2012.

SUMMARY OF EXPERIENCE

Ms. Martin joined the Chemistry Quality Assurance department in 2012 and is responsible for the verification and validation of analytical data to determine environmental data quality and usability. Data reviewed are generated following US EPA Contract Laboratory Program (CLP) protocols and SW-846 Methods. She evaluates laboratory data deliverables for compliance with regulatory and client-specific requirements.

Prior to this position, Ms. Martin worked as a quality assurance specialist and chemist for a major environmental laboratory in Georgia. She was responsible for managing performance evaluation (PE) studies and performing data method audits and internal quality system audits. In addition, she analyzed and evaluated samples utilizing Dionex® ion chromatograph (IC), Waters® HPLC, and Agilent® GC/FID and GC/ECD instruments for various clients.

KEY PROJECTS

- Performed analytical data validation interpreting volatile, semivolatile, and inorganic analyses and developed technical quality assurance reports for a major petroleum spill project.
- Verified analytical results from electronic data deliverables (EDDs) and database output during validation tasks.
- Performed senior-level review of data validation reports.

KRISTIN L. MAY
Quality Assurance Chemist III

ENVIRONMENTAL STANDARDS

FIELDS OF COMPETENCE

- Inorganic and wet chemistry data validation.
- PCB Aroclor data validation.
- Laboratory coordination.
- Data management.

CREDENTIALS

B.S., West Chester University, West Chester, Pennsylvania, 2001.

SUMMARY OF EXPERIENCE

Ms. May joined the Chemistry Quality Assurance Department in 2009 with over 5 years of environmental laboratory experience. As a Quality Assurance Chemist III, she is responsible for performing analytical data validation to determine environmental data quality and usability. Data reviewed are generated by US EPA Contract Laboratory Program (CLP) protocols and SW-846 Methods. She also acts as a coordinator for a client with its contracted laboratories to help resolve issues and to ensure that data deliverables are reported by the requested turn-around-times. She has also coordinated the efforts of several laboratories for a major pipeline company, including coordinating the field sampling events, delivery of bottleware from the laboratories to the field, delivery of samples from the field to the laboratory, and sample analysis. She ensured that the laboratory performed the analysis and reporting limits according to client specifications.

Ms. May has over 5 years experience as a wet chemistry laboratory technician for various environmental laboratories including an aquatic toxicology laboratory, a contract laboratory, and both small-scale and large-scale water and wastewater treatment plants.

Prior to her laboratory experience, she worked in the field of aquatic biology for the Philadelphia Water Department's Office of Watersheds and the Pennsylvania Department of Environmental Protection. Ms. May participated in creek and river assessments, specializing in aquatic macroinvertebrate collection and identification. She also assisted with habitat assessments, fish population studies, flow monitoring, fluvial geomorphology projects, report writing, and public outreach programs.

KEY PROJECTS

- Acts as the main contact for several laboratories and a major oil company. Tracks samples from time of collection to laboratory receipt and ensures data deliverables are reported by the requested turn-around-times. Also manages sample receipt, handling, analysis, and reporting issues.
- Performs analytical data validation interpreting PCB, inorganic, and general chemistry analyses and prepares technical quality assurance reports.
- Provides data validation services for projects to determine usability and defensibility of data as well as laboratory compliance with project-specific requirements.
- Performs senior-level review of data validation reports.
- Acted as the main contact for several laboratories and a large pipeline company and assisted in scheduling, sampling, and delivery of bottleware kits and of samples from the field. Also, provided chemistry communication between the laboratory and client. Worked with the IT Department to maintain a database, electronic data deliverable (EDD) specifications, and data verification module for the client. Verified proper deliverables from the laboratories to the client. Served as the day-to-day contact for all issues and communication among the laboratories, the client, and Environmental Standards.

ANDREW PIASECKI
Quality Assurance Chemist

FIELDS OF COMPETENCE

- Inorganic, organic, and wet chemistry data validation.

CREDENTIALS

B.S., Chemistry, Ursinus College, Collegeville, Pennsylvania, 2009.

SUMMARY OF EXPERIENCE

Mr. Piasecki, who is a recent graduate of Ursinus College, joined the Chemistry Quality Assurance Department in December 2009. He is responsible for analytical data validation to determine environmental data quality and usability. He is also responsible for the evaluation of laboratory data deliverables relative to regulatory and client-specific requirements. Data reviewed are generated by US EPA Contract Laboratory Program (CLP) Protocols and SW-846 Methods.

Mr. Piasecki researched the attachment of biothiophene to functionalized single-walled carbon nanotubes for the possible production of solar cells. He also investigated the electrical properties of single-walled carbon nanotubes.

KEY PROJECTS

Performed analytical data validation interpreting inorganic, organic, and wet chemistry analyses and prepared technical quality assurance reports for an energy company.

PRESENTATION/PAPER

Piasecki, A. "The Attachment of Bithiophene to Functionalized Single-Walled Carbon Nanotubes." Ursinus College, December, 2008.

Piasecki, A. "TCE in our Community." Ursinus College, February 2009.

ERIN E. RODGERS
Senior Quality Assurance Chemist II

ENVIRONMENTAL® STANDARDS

FIELDS OF COMPETENCE

- Data validation.
- Project, task, and data validation management.
- Laboratory coordination.
- Mentoring and training of junior chemists.
- Laboratory auditing.
- Performance Evaluation Studies.
- Evaluation of Target® and EvironQuant® electronic data files.
- Quality assurance oversight for environmental investigatory and remedial projects.
- Various inorganic and general chemistry analyses.

CREDENTIALS

B.S., West Chester University, West Chester, Pennsylvania, 2003.

PROFESSIONAL DEVELOPMENT COURSES

Understanding Project Management Practices, Villanova University, Pennsylvania, 2007.
Communication, Leadership and Motivation, Villanova University, Pennsylvania, 2007.

Multi-Agency Radiology Laboratory Analytical Protocols Manual; Part 1 Training; "The MARLAP Process", United States Environmental Protection Agency, Region 3 Philadelphia, Pennsylvania, August 2009.

SUMMARY OF EXPERIENCE

Ms. Rodgers joined the Chemistry Quality Assurance Department in 2004 with 4 years of environmental laboratory experience. As a Senior Quality Assurance Chemist II, she is responsible for performing analytical data validation to determine both analytical data quality and usability. Data reviewed include those for US EPA Contract Laboratory Program (CLP) protocols and SW-846 methods. In addition, she evaluates laboratory data deliverables to determine compliance with regulatory and client-specific requirements. Ms. Rodgers has performed project, task, and data validation management duties for several ongoing data validation projects and consulting projects. She has performed forensic review of data to confirm or refute results for several clients. She has conducted on-site environmental laboratory audits for several clients.

Ms. Rodgers serves as Data Validation Project Manager for a project involving a utility company fly ash spill in East Tennessee; in this position, she coordinates delivery of data packages from several laboratories and for several matrices; coordinates the efforts of junior chemists; and communicates with the laboratories and client on a weekly basis. Ms. Rodgers is responsible for ensuring the accuracy of all validation reports and verifying that data are reported consistently between the laboratory hardcopy and electronic data deliverable. In addition, she is responsible for tracking project schedules and deadlines and coordinating the efforts of several chemists to deliver validation reports on schedule. Furthermore, she works with the IT Department to maintain the project database. On a monthly basis, Ms. Rodgers travels to the site of the fly ash spill to assist in data management and chemistry consulting tasks with other site personnel.

Ms. Rodgers is the Project Manager for a project that requires the review of laboratory raw data to confirm or refute reported positive ethanol results at various sites in California. She also has coordinated the efforts of several laboratories for a major pipeline company, including coordinating the field sampling events, delivery of bottleware from the laboratories to the field, delivery of samples from the field to the laboratory, and sample analysis. She ensures that the laboratory performs the analysis and reporting limits according to client specifications.

Ms. Rodgers also is responsible for mentoring junior chemists. Her responsibilities include orientation and training on analytical methods, company standard operating procedures (SOPs) and protocols, and validation procedures.

Prior to joining Environmental Standards, Ms. Rodgers was employed at a privately owned environmental laboratory where she was responsible for drinking and waste water testing. She operated various instruments such as a Perkin Elmer ion chromatogram, an atomic adsorption, and a graphite atomic adsorption. Her laboratory experience provided a solid foundation for her responsibilities at Environmental Standards.

KEY PROJECTS

- Serves as Data Validation Project Manager for a project involving a utility company fly ash spill in Eastern Tennessee. Coordinates delivery of data packages from several laboratories and for several matrices; coordinates the validation efforts of several chemists; tracks project schedules and deadlines, and communicates with the laboratories and client on a weekly basis. In addition, she works with the IT Department to maintain the project database.

- Performed analytical data validation interpreting volatile, semivolatile, PCB, inorganic, and wet chemistry analyses and prepared technical quality assurance reports for clients that include a major pipeline company and a global technologies company.

- Performed laboratory audits for several major companies to assess laboratory quality and reliability. The audits evaluated laboratory adherence to good laboratory practices, laboratory quality assurance/quality control (QA/QC) programs, and the analytical methods requested by the clients.

- Assisted senior chemists as Validation Task Manager for several large projects. In addition, served as Project Manager for an ongoing assessment for a major pipeline company to assess total and hexavalent chromium, metals, volatile organic, polynuclear aromatic hydrocarbon, and wet chemistry analyses at several sites. Coordinated the efforts of several chemists to perform validation of organic and inorganic analytical data and to prepare technical quality assurance reports and communicated with clients regarding validation and deliverable issues; verified laboratory compliance with the guidelines set forth by the client in the QAPP.

- Verified analytical results from electronic data deliverables (EDDs) and database output during validation tasks.

- Serves as Project Manager responsible for evaluating laboratory electronic data files using software such as Target® and EvironQuant® to either confirm or refute laboratory-reported positive results for ethanol at several sites in California.

- Responsible for maintaining, cataloging, and archiving all electronic data packages received for a major client so that the data can be easily accessed at a later date.

- Assisted a senior chemist and Principal as Validation Task Manager for a large project for a major client. Communicated with the client, contractor, and various laboratories involved to coordinate receipt of data packages and EDDs. Also communicated with the various laboratories about missing deliverables and reporting issues. Coordinated the efforts of several chemists to perform validation and prepare quality assurance reports of PCB as Aroclors and Congeners, organchorine pesticide compounds, polycyclic aromatic hydrocarbons, and metals data on fish and sediment samples.

KEY PROJECTS (Cont.)

- Serves as Validation Project Manager for an environmental and engineering company. Responsible for coordinating delivery of data packages and EDDs with the client and performing data validation of the polycyclic aromatic hydrocarbon data.

- Acted as the main contact between several laboratories and a large pipeline company and assisted in scheduling, sampling, and delivery of bottleware kits and of samples from the field. Also, provided chemistry communication between the laboratory and client. Worked with the IT Department to establish a database, EDD specification, and data verification module for the client. Verified proper deliverables by the laboratories to the client. Served as the day-to-day contact for all issues and communication among the laboratories, the client, and Environmental Standards.

- Served as Project Manager for a small consulting project that involved determining the reliability of results performed by two different methods.

- Coordinated several double-blind performance evaluation studies for clients and participated in subsequent discussions to evaluate the laboratory-reported results. Assisted one client in coordinating a second performance evaluation study to confirm the results of the initial study.

- Assisted a client with a forensic evaluation of data to determine if data could be supported or refuted in advance of litigation.

- Assisted a client in setting up a procedure to investigate the potential cause of PAH contamination at its site. Coordinated with the laboratory and client to certify the collection bottleware, collection equipment, and laboratory extraction equipment. Once the samples had been collected and data reported, evaluated the data to provide feedback to the client on the potential causes of the contamination.

- Serves as the Project Manager verifying and reprocessing laboratory data files using Target and EnvironQuant software for a benzene, toluene, ethylbenzene, and xylenes (BTEX) project.

- Coordinated a double-blind PT evaluation that involved six laboratories and various consultants. Evaluated laboratory-reported results and assessed laboratory corrective actions.

PUBLICATIONS/PRESENTATIONS

Vitale, R. J., E. E. Rodgers, R. L. Forman. "A Novel Approach to Verifying Detection Limits." TCEQ Environmental Conference & Trade Fair, Austin, TX, April/May 2013.

Rogers, W., R. J. Vitale, J. N. Gable, E. E. Rodgers, J. P. Kraycik, and N. E. Carriker. "Porewater Studies Subsequent to the Kingston Ash Event." World of Coal Ash Conference, Lexington, KY, April 2013.

Rodgers, E. E., R. L. Forman, R. J. Vitale, W. J. Rogers, N. E. Carriker. "A Different Approach to Detection Limits." (Poster). SETAC North America 33rd Annual Meeting, Long Beach, CA, November 2012.

Vitale, R. J., R. L. Forman, J. N. Gable, E. E. Rodgers, *et. al.* "Implementation of a Field and Laboratory Quality Oversight Program During the TVA Kingston Fly Ash Recovery Project to Ensure High Quality and Defensible Data." TVA-Kingston Fly Ash Release Environmental Research Symposium, Harriman, TN, August 2-3, 2011.

Rogers, W. J., R J. Vitale, J. N. Gable, E. E. Rodgers, J. Gruzalski, and N. E. Carriker. "Observations of Metals and Metaloids in Sediment Porewater Associated with the Tennessee Valley Authority, Kingston, TN Ash Recovery." TVA-Kingston Fly Ash Release Environmental Research Symposium, Harriman, TN, August 2-3, 2011.

MATTHEW S. THOMAS
Senior Quality Assurance Chemist

FIELDS OF COMPETENCE

- Volatile and semivolatile organic data (generated by GC, GC/MS, and HPLC analysis) validation.
- Inorganic and general chemistry data validation.
- Pesticide and PCB data validation.
- Dioxin and furan data validation.
- Data validation and quality assurance oversight project management.

CREDENTIALS

B.S., Chemistry, Davis and Elkins College, Elkins, West Virginia, 1991.

B.S., Mathematics, Davis and Elkins College, Elkins, West Virginia, 1991.

SUMMARY OF EXPERIENCE

Mr. Thomas, who has 6 years of analytical quality assurance experience, is responsible for performing data validation for numerous site investigations to determine analytical data quality and usability and for managing various data validation efforts. Data reviewed include those for US EPA Contract Laboratory Program (CLP) protocols and SW-846 methods. He also is responsible for ensuring that data deliverables are compliant with regulatory and client-specific requirements.

Prior to this position, Mr. Thomas worked as a method development chemist for a major laboratory in Pennsylvania. He was responsible for developing analytical methods for various pharmaceutical products.

KEY PROJECTS

- Performed analytical data validation interpreting volatile, semivolatile, and inorganic analyses and developed technical quality assurance reports for a major petroleum spill project.
- Performed analytical data validation interpreting volatile and inorganic analyses and prepared data usability assessment reports for a coal fly ash remediation project.
- Verified analytical results from electronic data deliverables (EDDs) and database output during validation tasks.
- Performed analytical data validation interpreting volatile, semivolatile, and HRGC/HRMS PCB congener and dioxin/furan data for long-term site remediation project.

ROCK J. VITALE, CEAC
Technical Director of Chemistry/Principal

FIELDS OF COMPETENCE

- Analytical and environmental chemistry.
- Analytical method development and specification design.
- Corporate laboratory program design, execution, and maintenance.
- Laboratory auditing.
- Litigation support and analytical data dispute resolution.
- Method validation study design and execution.
- Forensic environmental chemistry (release fingerprinting).
- Performance evaluation study, design, and execution.
- Quality assurance oversight of large, complex (sediment) characterization projects.
- Rigorous third-party data validation for RI/FS, RFIs/CMS, Permit B, delisting studies, and CAA stack tests/trial burns.
- Representation of industry at regulatory meetings.
- Project-specific request for proposal preparation.
- Preparation or third-party review of Quality Assurance Project Plans.
- Sampling and analytical design - air, soils/sediments, surface/groundwater, and biota.
- Technical liaison among laboratories, industries, and consultants.
- Theoretical and practical knowledge of all facets of quantitative analysis for organic and inorganic pollutants by published methodologies.

CREDENTIALS

B.S., Environmental Science and Biology, Marist College, New York, 1981.

Additional Undergraduate Chemistry credits to satisfy B.S. Chemistry, Villanova University, Pennsylvania and Rider College, New Jersey, 1982-1985.

Villanova University, Pennsylvania. Chemistry Graduate Course Work.

CERTIFICATIONS AND AWARDS

Fellow - American Institute of Chemists (FAIC) - American Institute of Chemists, Alexandria, Virginia.
Certified Professional Chemist (CPC) - American Institute of Chemists, Alexandria, Virginia.
Certified Environmental Analytical Chemist (CEAC) - National Registry of Certified Chemists (NRCC), Washington, DC - Registrant #2510.
Chartered Fellow Chemist (FRACI CChem) - The Royal Australian Chemical Institute, Inc. - Registrant # 31900.

Environmental Standards named one of the Top Ten Method Developers in the April 1995 issue of *Environmental Laboratory.*

Environmental Standards awarded the Chrysler Corporation’s Vendor Excellence Award for designing and implementing the Chrysler Corporation Environmental Laboratory Program, April 1996.

Environmental Standards awarded the Columbia Gas Transmission Corporation 1997 Consultant of the Year Award for performing quality assurance oversight for the 19,000-mile pipeline environmental investigation.

BOARD OF DIRECTORS/ADVISORY BOARD AND EXPERT PANEL APPOINTMENTS

Editorial Board of The Chemist, A journal of The American Institute of Chemists, (May 2012 to present)
Officer, Members-at-Large, American Society of Testing and Materials (ASTM), Committee E36 – Conformity Assessment (Term January 2006-December 2007).
US EPA Office of Inspector General-Expert Panel-Evaluation of Drinking Water Laboratory Procedures-Selected Panelist (2005).
American Institute of Chemists – Board Member (1997-2003, 2007 - present).
Appointed Federal Advisory Committee Board Member – Environmental Laboratory Advisory Board (ELAB) (2004 - 2010).
Invited Expert-TCEQ PCB Advisory Group (2005).
Standard Methods for the Evaluation of Water and Wastewater – Chairman of the Joint Technical Group (JTG) - Section 3500-Cr (2002-present).
Society of Applied Spectroscopy – Delegate (2000-2002).
National Water Quality Monitoring Council Methods and Data Comparability Board – Board Member (September 2001-present).
National Registry for Certified Chemists – Board Member (July 2001-December 2009).
Environmental Testing & Analysis – Advisory Board Member (1998-2001).
Environmental Standards, Inc. CEO and Chairman of the Board (1987-present).

PROFESSIONAL AFFILIATIONS

American Chemical Society - Member # 00971942
American Industrial Hygiene Association (AIHA) - Elected Member - #158051
American Institute of Chemists - Fellow
Editor - *The Chemist,* 1995-2003
The Royal Society of Chemistry - Member #335273
The Royal Australian Chemical Institute, Inc. - Fellow 31900
American Water Works Association - Member
American Society of Testing and Materials - Member (Subcommittees E36.10-E36.50 and 50.02) - #000115510
American Society of Quality Control - Member (Symposium Co-Chair 1995)
International Society of Environmental Forensics - Member
Society of Toxicology and Chemistry (SETAC) - Member - #180963
United States EPA SW-846 Inorganics Workgroup - Invited SW-846 Workgroup Member and OSWER/WTQA Symposium Committee, 1996–2001

SUMMARY OF EXPERIENCE

Mr. Vitale has 29 years of analytical quality assurance experience. Specifically, he has 6 years of analytical experience performing analyses for organic and inorganic contaminants in a variety of media by instrumental and classical methods, including research and development of analytical methodologies. As a Principal of Environmental Standards, Mr. Vitale oversees a staff of approximately 35 quality assurance chemists and is responsible for the direction of the technical and managerial aspects of the Valley Forge, Pennsylvania, operations. Mr. Vitale is a recognized expert in the following fields: organic and inorganic data validation (including specialty analyses); laboratory auditing; preparation or third-party review of quality assurance project plans (QAPjPs) for remedial investigations/feasibility studies (RIs/FSs); Resource Conservation and Recovery Act (RCRA) Facility Investigations/Corrective Action Program (RFI/CAP) and remedial actions; design of specialty analyses to accommodate project-specific data quality objectives (DQOs); design of quality assurance programs; and agency negotiations.

Prior to co-founding Environmental Standards, Mr. Vitale was the Quality Assurance Manager for a large environmental consulting firm with 26 offices nationwide. He designed and implemented a quality assurance and data validation program for all RI/FSs, site inspections, and RCRA closures. His responsibilities also included the preparation of QAPjPs for Superfund/RCRA studies in all US EPA Regions, as well as a number of state-led projects. He also trained and managed a staff of five data reviewers. Mr. Vitale served as technical liaison among potentially responsible parties (PRPs), laboratories, and/or state and federal agencies.

Prior to the QA Manager position, Mr. Vitale served as a quality assurance chemist with a primary US EPA Superfund contractor for US EPA Region III for 3 years. He provided quality assurance reviews for over 300 US EPA site inspections, based upon rigorous examination of gas chromatography (GC), GC/mass spectroscopy (GC/MS) (high and low resolution), graphite furnace atomic absorption (GFAA), and inductively coupled plasma (ICP) data. He co-authored and provided peer-review comments on numerous documents on the subject of data validation for both state and federal agencies.

KEY PROJECTS

- Provided response-wide quality assurance oversight of environmental sampling and the analytical efforts in the Gulf of Mexico for the Mississippi Canyon 252 Deepwater Horizon oil release. Responsibilities included the preparation of a comprehensive QAPjP; laboratory audits; field sampling audits of the collection of air, oil, biota, surface water, waste and sediment samples; validation and verification of associated analytical project data; and on-site chemistry consulting. Provided immediate support at the Gulf Coast Incident Command in Houma, Louisiana, following the release, and then transitioned to the Gulf Coast Restoration Organization in New Orleans, Louisiana.

- Provided project management and quality assurance oversight for the Tennessee Valley Authority (TVA) Kingston Fossil Plant Fly Ash Release cleanup project – the largest fly ash release to a river system in the United States. Responsibilities included the preparation of a comprehensive QAPjP; laboratory selection and on-going audits; critical real-time data validation of associated analytical project data; meeting attendance; and on-site chemistry consulting.

- Provided quality assurance oversight of environmental sampling and data management for a major natural gas exploration and production company in the Marcellus Shale region. Responsibilities included the preparation of a field sampling plan and QAPjP; validation and verification of associated analytical project data; and chemistry consulting.

- Performed data validation for more than 500 multi-media RIs/FSs, RCRA RFIs, and remedial actions and routine monitoring projects on data generated by more than 350 laboratories on projects throughout the United States.

- Prepared QAPjPs, which included formulation of DQOs, for more than 75 privately funded RIs/FSs, RFIs, and remedial actions (*e.g.*, drum removals) for submission to federal and state regulatory agencies. Also, performed third-party review and comment on QAPjPs prepared by other entities for a significant number of RIs/RSs and RFIs prior to submission of the documents to the lead regulatory agency.

- At the request of Fortune 500 companies, engineering companies, and in some instances, the audited laboratories, conducted comprehensive laboratory audits of over 200 laboratories (domestic and international) in the areas of organics analyses, inorganic analyses, classical parameters, and specialty analyses. Provided critical comments, recommendations, and performance evaluation (PE) reports.

- Designed, executed, and maintained corporate laboratory programs for a number of Fortune 500 companies. Corporate programs included performing a needs assessment for facilities, execution of round-robin blind PE studies, laboratory audits of candidate laboratories, preparation of detailed technical and cost specifications/requests for proposal (RFPs), evaluation of laboratories' proposals, assistance in contract and logistics execution, and maintenance of corporate laboratory contract programs.

KEY PROJECTS (Cont.)

- Designed analytical specifications and DQOs, including modifications to analytical methods and oversight of project laboratories performing method validation, for a significant number of projects. Key projects included design of analytical methods to achieve part-per-trillion level detection limits for 1,2,3-trichloropropane in river water by GC/MS and design of an analytical method to achieve part-per-trillion level detection limits for Mirex, Photomirex, and Kepone in air, water, soil, and biota using isotope dilution techniques and chemical ionization (CI) GC/MS. Furthermore, conceived of, designed, and provided complete oversight for a 4-month method evaluation study (MES) for the development of an alkaline digestion method for the analysis for hexavalent chromium in soil samples. The complete MES report was submitted to the SW-846 workgroup for inclusion in the methods manual. The inclusion of promulgated Method 3060A in the third update of SW-846 is credited to Mr. Vitale.

- Prepared a significant number of comprehensive RFPs for analytical services for a wide variety of large short-term and long-term environmental investigations. Evaluated laboratory proposals, provided recommendations for award, and participated in contract negotiations.

- Acted as sole-source quality assurance oversight consultant in the areas of general consultation, analytical problem troubleshooting, and dispute resolution/arbitration for a number of Fortune 500 companies. Attended frequent meetings and negotiations with federal and state agencies on behalf of clients and provided training seminars to corporate environmental groups on the subjects of quality assurance and analytical chemistry.

- Provided complete quality assurance oversight for three sampling consultants and five project laboratories for the performance of sampling and analysis for more than 60 individual chromite ore processing residue contaminated sites in the state of New Jersey. Oversight included scheduling analyses, ordering bottleware, performing field and laboratory audits, sample tracking, database input and maintenance, laboratory invoice approval, data validation, and attending monthly meetings with the state.

- Provided complete quality assurance oversight for two project laboratories for the analysis of organic vapors collected from vapor wells installed in Long Island, New York, around a major gasoline importer. Approximately 120 samples per month were collected using Tenax/ambersorb cartridges and were analyzed by thermal desorption GC/MS for a variety of gasoline-related components. Oversight included summarizing preliminary data received (via fax) from the project laboratories and, subsequently, disseminating the information to the project team, performing field and laboratory audits, sample tracking, database input and maintenance, laboratory invoice approval, and data validation.

- Provided complete quality assurance oversight for 2-year environmental impact studies performed at a publicly owned treatment works (POTW) in New York State. Oversight included preparing the sampling consultant RFP, assisting in the selection process, reviewing the Work Plans and QAPjPs, performing field and laboratory audits, validating all project analytical data, and attending monthly meetings with the steering committees.

- Provided complete quality assurance oversight for a 19,000-mile gas transmission pipeline investigation. Oversight included assisting in the laboratory selection process, reviewing the QAPjP, performing field and laboratory audits, validating data, initiating blind PE samples, and attending meetings.

- Trained, supervised, and managed a substantial staff of quality assurance personnel. In addition, conducted numerous training seminars on environmental quality assurance throughout the United States.

KEY PROJECTS (Cont.)

- Provided complete quality assurance oversight on a large sediment investigation on the lower Hudson River. Oversight included laboratory selection, QAPjP preparation, conducting field and laboratory audits, data validation, data management (including data visualization by EVS), and meeting attendance.

- Provided project management and quality assurance oversight for the remediation efforts related to a 100-million gallon fly ash release by an international utility company. Responsibilities included the preparation of a comprehensive field sampling plan and QAPjP; the quality assurance of all field data including air, ash, biota; monitoring well, residential well, surface water, and sediment samples; preparation of data statistics and report for the public and various agencies; oversight of surface water and residential well sampling efforts; and validation of 10% of the analytical project data.

- Contributing author of the 1986 prototype of "Functional Guidelines for Organic Data Validation With Modifications for Use Within US EPA Region III."

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Stearns, B., R. J. Vitale, and K.F. Young. "A Novel Approach for Identifying Sources of PCB Contamination. A Case Study for a Large Sediment Characterization Project." TCEQ 2007. Austin, TX, May 2007.

Vitale, R.J., B. Stearns, and K. M. Young. "Differentiating Multiple Sources of PCB Aroclors Using Additional Formulation Information on a River Sediment Characterization Project." SETAC North America 28th Annual Meeting. Milwaukee, WI, November 11-15, 2007.

Vitale, R.J. "Observations of Best and Worst Practices During On-Site Laboratory Audits - The Good, the Bad, and the Ugly." The NYAAEL & PaAAEL Conference, Syracuse, NY, July 30-31, 2007.

Vitale, R.J.; D. P. Callaghan, and J. P. Kraycik. "A Novel Modeling Methodology to Assist in Assessing Historical Data Quality for Sediment Characterization." 2007 National Environmental Monitoring Conference. Boston, MA, August 21-23, 2007.

Zvarick, K., R. J. Vitale, W. R. Hufford, and G. L. Kirkpatrick. "A Risk-Based Evaluation of Ambient and Background Air Sample Data." The AWMA Vapor Intrusion Conference. Providence, RI, September 26-28, 2007.

Vitale, R.J. "Ignoring The White Elephant In The Room – Method Detection Limits Under 40 CFR Part 136 from A Data Validation And Data User's Perspective." Texas Environmental Trade Fair and Exhibition. Austin, TX, May 1-3, 2007.

Callaghan, C., R. J. Vitale, J. Kraycik, K. Frysinger, and D. Kalet. "A Novel Volume and Mass Estimation Methodology to Support Iterative Sediment Remedial Scenarios Using Data of Known Quality." The 233rd ACS National Meeting, Chicago, IL, March 25-29, 2007.

Stearns, B., R. J. Vitale, and K. M. Young. "A Case Study of Source Identification of PCB Contamination. The Seventh Annual AEHS Meeting and West Coast Conference on Soils, Sediments and Water. San Diego, CA, March 19-22, 2007.

Vitale, R. J. "Purchasing Analytical Services - Method Flexibility and the Need to Educate the Analytical Buyers." Workshop - Benchmarking Reliable Data: The Challenges of Quality Control. PittCon 2007. Chicago, IL, March 1, 2007.

Blye, D. R. and R. J. Vitale. "Performance-Based Measurement Systems: A Double Edged Sword - Buyer Beware." The 22nd Annual National Environmental Monitoring Conference. Arlington, VA, August 28-31, 2006.

Vitale, R. J. "Difficulties in Proper Implementation of the Methods Innovation Rule With Commercial Laboratories." The Annual Environmental Laboratory Convention and Exposition. Valley Forge, PA, July 30-August 1, 2006.

PRESENTATIONS (Cont.)

Blye, D. R. and R. J. Vitale. "Analytical Considerations for Applying EPA Method 1668A for PCB Analysis on Soil and Sediment Investigations." The Society of Toxicology and Chemistry (SETAC) – Hudson Delaware Chapter. West Chester University, West Chester, PA, May 4-5, 2006.

Blye, D. R. and R. J. Vitale. "Analytical Considerations for Applying EPA Method 1668A for PCB Analysis on Soil and Sediment Investigations." The 22nd Annual Soils, Sediments and Water Conference. University of Massachusetts at Amherst, Amherst, MA, October 16-19, 2006.

Vitale, R. J. and T. G. Tunnicliff. "Performance Monitoring of the BP Global Contract Laboratory Network (GCLN)." The 17th Annual Meeting. Calgary, Alberta, Canada, October 3-6, 2005.

James, Bruce R. and R. J. Vitale. "Chromium(III) Oxidation in Chromite Ore Processing Residue-Enriched Soils: Theoretical Predictions and Experimental Observations." The 21st Annual National Environmental Monitoring Conference (NEMC). Wyndham City Center, Washington, DC, July 25-27, 2005.

Vitale, R. J., S. T. Zeiner, and E. T. Lahr. "Perchlorate Utilization of Ion Chromatography and Liquid Chromatography on Characterization Project." The 21st Annual National Environmental Monitoring Conference (NEMC). Wyndham City Center, Washington, DC, July 25-27, 2005.

Vitale, R. J., D. R. Blye, R. L. Forman, and D. J. Lancaster. "Method Detection Limits: A Data User's Perspective." The 21st Annual National Environmental Monitoring Conference (NEMC), Wyndham City Center, Washington, DC, July 25-27, 2005.

Vitale, R. J. and K. R. Clay. "An Evaluation of Analyte Isolation and Analytical Finish Methods for Cr(VI) in Solids." The 21st Annual National Environmental Monitoring Conference (NEMC). Wyndham City Center, Washington, DC, July 25-27, 2005.

Vitale, R. J. "Approaches To Designing A Low-Level Method." Texas Commission of Environmental Quality (TCEQ) Conference. Austin, TX, May 2-4, 2005.

Vitale, R. J. and R. L. Forman. "Obtaining Legally Defensible Analytical Chemistry Laboratory Data." 2004 Annual Environmental Laws and Regulations Conference. Harrisburg, PA, April 13, 2004.

Blye, D. R., R. J. Vitale, and R. L. Forman. "Forensic Electronic File Review." The 19th Annual International Conference on Contaminated Soils, Sediments, and Water. Amherst, MA, October 20-23, 2003.

Vitale, R. J. and D. J. Lancaster. "Whole Effluent Toxicity Laboratory Testing: Lessons Learned from Auditing Method Compliance, Technique, and Documentation." BP Soil and Groundwater Center of Expertise Annual Meeting. BP Westlake Park Complex, Houston, TX, September 30 - October 2, 2002.

Vitale, R. J., R. L. Forman, and G. L. Kirkpatrick. "Data Quality Audits." Auditing in a Changing World - The Auditing Round Table. Hyatt Regency, Atlanta, GA, September 17-20, 2002.

Vitale, R. J. "Laboratory System Auditing." Third Annual US ACE Program Analytical Compliance, Analytical Program Compliance Data Quality Objectives. The Galt House Hotel, Louisville, KY, June 18, 2002.

Vitale, R. J. Moderator and Session Chair. "Metals: Sampling and Analysis." The National Water Quality Monitoring Council (NWQMC) National Monitoring Conference 2002. Madison, WI, May 19-23, 2002.

Vitale, R. J., M. R. Green, and R. L. Forman. "Commercial Environmental Laboratory On Site Audits - Observations and Recommendations for Enhancing Method Requirements," under the session Principles of Environmental Sampling and Analysis – Two Decades Later. The American Chemical Society (ACS) 224th National Meeting. Boston, MA, August 18-22, 2002.

PRESENTATIONS (Cont.)

Forman, R. L. and R. J. Vitale. "Performance Evaluation Studies – What Can They Tell You?" under the session Principles of Environmental Sampling and Analysis – Two Decades Later. The American Chemical Society (ACS) 224th National Meeting. Boston, MA, August 18-22, 2002.

Roberts, T. M., R. J. Vitale, M. A. Michell. "Assessment of the Effects of Active Sites in Discrete Sampling, Purge, and Trap Concentrators on Oxygenated Compounds." The 17th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, August 13-16, 2001.

Zeiner, S. T., D. J. Lancaster, and R. J. Vitale. "Negative Effects of the 'Grand Mean' Calibration Approach on Generated Internal Surrogate Compounds Recovery Limits." The 17th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, August 13-16, 2001.

Vitale, R. J. "Certification and Environmental Chemistry," under the session The Professional Chemist and Certification, The American Chemical Society (ACS) 221st National Meeting. San Diego, CA, April 2-5, 2001.

Forman, R. L. and R. J. Vitale. "Concrete Chips as a Test Medium for a Performance Evaluation Study." PittCon 2001. New Orleans, LA, March 7-9, 2001.

Vitale, R. J. "Data Validation and Detecting Laboratory Fraud," Analytical Program Compliance – Future Directions for a Quality Analytical Program, First Annual Meeting Louisville District US ACE, Louisville, KY, November 9, 2000.

Forman, R. L., R. J. Vitale, and D. P. Callaghan. "Data Comparability of Volatile Soil Samples Collected in Pennsylvania by 'Traditional' and EnCore® Sampling Techniques." The 16th Annual International Conference on Contaminated Soils, Sediments, and Water. Amherst, MA, October 16-19, 2000.

Blye, D. R. and R. J. Vitale. "Trivalizing Environmental Data Validation." The 76th Annual American Institute of Chemists National Meeting. Alexandria, VA, June 1-3, 2000.

Vitale, R. J. and R. L. Forman. "Soil Field Duplicates Versus Laboratory Duplicates for Mercury on a Large Multi-State Pipeline Investigation." The 14th Annual Conference on Contaminated Soils. Amherst, MA, October 25-28, 1999.

Wibby, C. and R. J. Vitale. "Standard Reference Materials: Challenges and Applicability in Implementing PBMS." ASQEED, Best Practices for the Energy Industry. San Antonio, TX, October 3-6, 1999.

Head, J. G., R. J. Vitale, M. Cohen, and K. J. Robbins. "Comparison of Field Duplicate, Laboratory Duplicate, and Matrix Spikes for Mercury in a Large Multi-State Pipeline Investigation." The 15th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, July 18-22, 1999.

Dupes, L. J. and R. J. Vitale. "Reactive Sulfide Analysis: A Case Study in Auditing Waste Characterization Methodologies." The 15th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, July 18-22, 1999.

Forman, R. L. and R. J. Vitale. "Lessons Learned From Performance Evaluation Studies." The 15th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, July 18-22, 1999.

Vitale, R. J. and F. J. Carlin, Jr. "The Use of Sulfuric Acid Cleanup Techniques To Minimize Matrix Interferences for the Analysis for Toxaphene in Soils and Sediments." The 15th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, July 18-22, 1999.

Forman, R. L., R. J. Vitale, C. Wibby, and J. Lowery. "Evaluating Environmental Laboratory Performance Using Multi-Phase Reference Materials." PittCon '99. Orlando, FL, March 7-12, 1999.

PRESENTATIONS (Cont.)

Vitale, R. J., K. Robbins, D. P. Callaghan, and J. Head. "Comparison of Soil Field Duplicate Versus Laboratory Duplicate Results for Mercury on a Large Multi-State Pipeline Investigation." PittCon '99. Orlando, FL, March 7-12, 1999.

Vitale, R. J., R. L. Forman and L. J. Dupes. "Comparison of Volatile Organic Compound Results Between Method 5030 and Method 5035 on a Large Multi-State Hydrocarbon Investigation." The 14th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, July 13-15, 1998.

Dupes, L. J., R. J. Vitale and D. J. Weaver. "Ignitability Performance Evaluation Study - Are Your Wastes Being Correctly Characterized?" The 14th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, July 13-15, 1998.

Forman, R. L., R. J. Vitale, D. C. Nuber, and D. P. Callaghan. "A Case Study: Effective Assessment of Data Usability During a Multi-Year Air Study." 91st Annual Air and Waste Management Association Meeting. San Diego, CA, June 14-18, 1998.

Vitale, R. J. and R. L. Forman. "A Comparison Of Single-Blind Versus Double-Blind Performance Evaluation Sample Results From Commercial Environmental Laboratories." The 75th Annual American Institute of Chemists National Meeting. Philadelphia, PA, May 28-30, 1998.

Vitale, R. J. and D. R. Blye. "Laboratory Audit Conformance Requirements for Chemical Standards In Environmental Analysis." PittCon '98. New Orleans, LA, March 1-5, 1998.

Vitale, R. J. "Balancing Regulatory Compliance with Technical Validity." Soil Sampling for Volatile Organics Seminar, O'Hare International Holiday Inn, Chicago, IL, December 10, 1997.

Mussoline, G. R. and R. J. Vitale. "A Statistical Analysis of an Analytical Holding Time for Hexavalent Chromium." SUPERFUND XVIII. Washington, DC, December 2-4, 1997.

Blye, D. R. and R. J. Vitale. "General Electric Waste and Wastewater Sampling and Analytical Issues Workshop." General Electric Company. Toronto, Canada, September 19, 1997.

Lancaster, D. J. and R. J. Vitale. "An Evaluation of Methods for Quantifying Polychlorinated Biphenyls in Environmental Samples." The American Institute of Chemists 74th National Meeting. Las Vegas, NV, September 4-6, 1997.

Vitale, R. J. "Balancing Regulatory Compliance with Technical Validity." Soil Sampling for Volatile Organics Seminar, Philadelphia Airport Hilton. Philadelphia, PA, August 14, 1997.

Vitale, R. J., G. R. Mussoline, and K. A. Rinehimer. "Environmental Monitoring of Chromium in Air, Soil, and Water." Chromium Symposium-1996. Arlington, VA, April 23-24, 1996.

Vitale, R. J., G. R. Mussoline, J. C. Petura, and B. R. James. "US EPA Proposed Cr(VI) Analytical Method: A Reliable Analytical Method for Extracting and Quantifying Cr(VI) in Soils." The Sixth West Coast Conference on Contaminated Soils and Groundwater. Newport Beach, CA, March 11-14, 1996.

Vitale, R. J. and L. J. Dupes. "Case Study: A Laboratory Performance Evaluation Study - An Important Part of the Lab Selection Process." US EPA Region II and New York Water Environment Associates Symposium - Current Topics in Environmental Management: Air, Hazardous Waste, Water, Wastewater and Groundwater at the IBM Corporation. Yorktown Heights, NY, November 2, 1995.

Mussoline, G. R., K. A. Rinehimer, and R. J. Vitale. "Chromium Speciation Analysis in Soils/Sediments - Zero Percent Matrix Spike Recoveries May Not Equal Unreliable Data." 10th Annual Conference on Contaminated Soils. Amherst, MA, October 23-26, 1995.

PRESENTATIONS (Cont.)

Vitale, R. J. and D. R. Blye. "Selecting an Environmental Laboratory." Environmental Laboratories: Testing the Waters, Water Environment Federation. Cincinnati, OH, August 13-16, 1995.

Grega, K. K. and R. J. Vitale. "QA/QC Considerations for Radiological Monitoring." Beneficial Reuse '95 Third Annual Conference on Recycle and Reuse of Radioactive Scrap Metal. Knoxville, TN, July 31 - August 3, 1995.

Vitale, R. J., G. Mussoline, and W. Boehler. "Interlaboratory Comparison of Quality Control Results from a Long-Term Vapor Well Monitoring Investigation Using a Hybrid EPA Method T01/T02 Methodology." US EPA 11th Annual Waste Testing and Quality Assurance Symposium. Washington, DC, July 23-28, 1995.

Blye, D. R. and R. J. Vitale. "Data Quality - Assessment of Data Usability Versus Analytical Method Compliance." US EPA 11th Annual Waste Testing and Quality Assurance Symposium. Washington, DC, July 23-28, 1995.

Vitale, R. J. and D. R. Blye. "Environmental Data Quality Assurance Seminar." Phillips Petroleum Corporation. Bartlesville, OK, May 24, 1995.

Vitale, R. J. and D. R. Blye. "Environmental Data Quality Assurance Seminar." Ford Motor Co. Dearborn, MI, May 18, 1995.

Vitale, R. J. "Assessing Data Quality for Risk Assessment Through Data Validation." Second Symposium on Superfund Risk Assessment in Soil Contamination Studies. Phoenix, AZ, January 26-27, 1995.

Vitale, R.J. and D. R. Blye. "Environmental Data Quality Assurance Seminar." Exxon Biomedical Services, Inc. East Millstone, NJ, January 24-25, 1995.

Vitale, R. J. "Cost Savings and Enhanced Data Quality Through Thoughtful Project Planning." US EPA Region II RCRA Outreach Seminar on Quality Assurance in Environmental Decision-Making at the IBM Corporation. Yorktown Heights, NY, November 2, 1994.

Vitale, R. J. "How to Audit Environmental Laboratories." Workshop on Generating Scientifically Valid and Legally Defensible Data, US EPA Office of Compliance Personnel. Crystal City, VA, July 15, 1994.

Vitale, R. J., B. James, G. Mussoline, and J. Petura. "Hexavalent Chromium Methods for Soils; Results of Extraction Comparison Research and Multi-Laboratory Holding Time Study." US EPA 10th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, July 11-14, 1994.

Vitale, R. J. "Do Low Matrix Spike Recoveries Equal Bad Data: A Case Study of Hexavalent Chromium in Soil." Conference on Quality Assurance in Environmental Monitoring and Workshop on Generating Scientifically Valid and Legally Defensible Data. Alfred, NY, May 18, 1994.

Vitale, R. J. "Regaining Control of Your Environmental Investigation Through Auditing Your Environmental Laboratory." Conference on Quality Assurance in Environmental Monitoring and Workshop on Generating Scientifically Valid and Legally Defensible Data. Alfred, NY, May 18, 1994.

Vitale, R. J. "Procedures for Auditing Laboratories." Quality Assurance in Environmental Monitoring. Syracuse, NY, March 7, 1994.

Vitale, R. J., G. R. Mussoline, B. R. James, and J. C. Petura. "Innovative Quality Control Approach to Quantifying Hexavalent Chromium in Soils." PittCon '94. Chicago, IL, February 27 - March 4, 1994.

Vitale, R. J., G. R. Mussoline, B. R. James, and J. C. Petura. "Interpretation of Ancillary Parameters and Matrix Spike Recovery Data for Hexavalent Chromium Determination In Soils." SUPERFUND XIV. Washington, DC, November 30 - December 2, 1993.

Vitale, R. J. "Auditing Your Environmental Laboratory." Sampling, Analyzing and Validating Your Environmental Data Seminar. Philadelphia, PA, November 8-9, 1993.

PRESENTATIONS (Cont.)

Vitale, R. J. "Procedures for Auditing Laboratories." Conference on Quality Assurance in Environmental Monitoring. Yorktown Heights, NY, October 21, 1993.

Vitale, R. J. "A Method Evaluation Study for the Analysis for Hexavalent Chromium in Solid Samples Using a Modified Alkaline Digestion Procedure and Colorimetric Determination." US EPA Ninth Annual Waste Testing and Quality Assurance Symposium. Crystal City, VA, July 12-16, 1993.

Vitale, R. J. and D. R. Blye. "Environmental Data Quality Seminar." Amoco Oil Co. Chicago, IL, May 13, 1993.

Miller, M., R. J. Vitale, and R. Beach. "Data Management Systems in Performance Measurements - Techniques in Overall Data Quality Assessment." 20th Annual Conference on National Energy and Environmental Quality, American Society of Quality Control (ASQC), 1993.

Vitale, R. J. "Data Validation." Quality Assurance in Environmental Monitoring Conference, NYS DEC. Albany, NY, November 18, 1992.

Vitale, R. J. "Data Validation." Quality Assurance in Environmental Monitoring Conference, New York Water Pollution Control Association, Inc. and Westchester Community College. Yorktown Heights, NY, November 19, 1992.

Vitale, R. J. "QAPP Design for Sampling and Analysis of Hexavalent Chromium in Various Media." Hexavalent Chromium Analytical Methods Workshop. Arlington, VA, October 15, 1992.

Vitale, R. J. "Laboratory Audits." Merck & Co., Inc. 1991 Environmental Conference. Montreal, Canada, June 26, 1991.

Vitale, R. J. "Cost-Effective Site Investigations." Controlling the Costs of Site Remediation Seminar, Environmental Resources Management-New England, Inc. Boston, MA, June 20, 1989.

CONFERENCE MODERATOR/CHAIR

Vitale, R. J. Session Chair. "Innovative Planning and Quality Oversight for the Characterization of Complex Sediment Investigations." SETAC North America 27th Annual Meeting. Montreal, Canada, November 3-9, 2006.

Vitale, R. J. Session Chair. "Metals: Sampling and Analysis." The National Water Quality Monitoring Council (NWQMC) National Monitoring Conference 2002. Madison, WI, May 19-23, 2002.

Vitale, R. J. Moderator and Session Chair, "Technical Issues in Chemistry." The 76th Annual American Institute of Chemists National Meeting. Alexandria, VA, June 1-3, 2000.

Vitale, R. J. Moderator and Session Chair, "PBMS Laboratory Auditing and Accreditation." The 15th Annual Waste Testing and Quality Assurance Symposium. Arlington, VA, July 18-22, 1999.

Vitale, R. J. Moderator and Conference Co-Chair, Technical Issues in Chemistry. The 75th Annual American Institute of Chemists National Meeting. Philadelphia, PA, May 28-30, 1998.

Vitale, R. J. Moderator and Conference Co-Chair, "Technical Issues in Chemistry." The New Alchemist, The American Institute of Chemists 74th National Meeting, Las Vegas, NV, September 4-6, 1997.

Vitale, R. J. Moderator, Quality Assurance Workshop, "Environmental Laboratories: Moving Toward the 21st Century," Water Environment Federation (WEF). Philadelphia, PA, August 3-6, 1997.

Vitale, R. J. Moderator and Conference Co-Chair, International Standards, 39th Annual Quality Symposium, "Navigating the Quality Process," Philadelphia Section of the American Society of Quality Control. Philadelphia, PA, November 14, 1995.

THOMAS H. WEINMANN
Senior Quality Assurance Chemist II

ENVIRONMENTAL STANDARDS

FIELDS OF COMPETENCE

- Volatile and semivolatile organic data (generated by GC, GC/MS, and HPLC analysis) validation.
- Inorganic and wet chemistry data validation.
- Pesticide and PCB data validation.
- Radiochemistry data validation.
- Dioxin and furan data validation.
- HRGC/HRMS data validation.
- Data validation and quality assurance oversight project management.

CREDENTIALS

B.S., Chemistry, West Chester University, West Chester, Pennsylvania, 1999.

B.S., Computer Science, Shippensburg University, Shippensburg, Pennsylvania, 1993.

SUMMARY OF EXPERIENCE

Mr. Weinmann, who has 12 years of analytical quality assurance experience, is responsible for performing data validation for numerous site investigations to determine analytical data quality and usability and for managing various data validation efforts. Data reviewed include those for US EPA Contract Laboratory Program (CLP) protocols and SW-846 methods. He also is responsible for ensuring that data deliverables are compliant with regulatory and client-specific requirements.

Prior to this position, Mr. Weinmann worked as a software developer for a major employer services firm. He was responsible for developing Windows-based Human Resource Information Systems that included employee data and benefits administration and payroll processing functionality.

While studying chemistry at West Chester University, Mr. Weinmann assisted in research in the field of graphite intercalation. He prepared a diolefin diphosphine cobalt complex using vacuum line techniques that proved to be an effective alkali metal carrier for ambient temperature intercalation reactions.

KEY PROJECTS

- Manages the ongoing data validation and quality assurance oversight efforts for several industrials required to periodically monitor PCB discharge levels in support of Pollutant Minimization Plans.
- Assists with the inorganic and radiochemistry data validation efforts associated with the characterization, remediation, and monitoring activities at a legacy mine site.
- Managed the data validation and quality assurance oversight efforts for a remedial investigation on a portion of the Hackensack River in New Jersey. Responsibilities included assisting in the procurement of laboratory analytical services; coordination of sampling and analytical work; validation of organic, inorganic, wet chemistry, and radiochemistry data; and preparation of the required data deliverables.
- Assisted in the preparation of a Quality Assurance Project Plan for the environmental activities related to a facility remediation program to ensure data quality by detailing specific methods and procedures.
- Managed the data validation and quality assurance oversight efforts for a coalition of Delaware River Estuary point-source dischargers tasked with providing analytical data to a regulatory agency as part of a PCB TMDL study. Responsibilities included assisting in the procurement of laboratory analytical services, coordination of the sampling and analytical work, validation of HRGC/HRMS PCB congener data, and preparation of the data deliverables required by the agency.
- Managed quick turn-around data validation efforts to determine the impact of a petroleum spill on the surrounding soil and groundwater. The laboratory data for nearly 800 samples analyzed for volatile organic compounds were validated and presented to the client within 2 weeks.

KEY PROJECTS (Cont.)

- Performed analytical data validation interpreting volatile, semivolatile, PCB, and inorganic analyses and developed technical quality assurance reports for a major gas pipeline project.

- Performed analytical data validation interpreting volatile, semivolatile, and inorganic analyses and prepared data usability assessment reports for a petroleum refinery site investigation.

- Verified analytical results from electronic data deliverables (EDDs) and database output during validation tasks.

- Performed analytical data validation interpreting volatile, semivolatile, and inorganic analyses on groundwater and residential well samples and prepared technical quality assurance reports for a manufacturing plant site investigation.

- Performed analytical data validation interpreting historical semivolatile and inorganic data that had been reprocessed due to laboratory error and prepared technical quality assurance reports for a manufacturing plant site investigation.

- Managed the analytical data validation efforts to confirm the presence of PCB and inorganic analytes identified in a prior phase of the investigation in surface water and sediment samples from a canal adjacent to a parcel of land under consideration for real estate transactions.

- Performed analytical data validation interpreting semivolatile and inorganic analyses on performance evaluation samples submitted to several laboratories and prepared comparative reports for a quarterly monitoring program.

- Managed the data validation and efforts for a multiphase study conducted on a portion of the Upper Columbia River in Washington. Responsibilities included validation of sediment, surface water, and fish tissue analytical data and preparation of the required data deliverables.

ENVIRONMENTAL® STANDARDS

GARY P. YAKUB
Senior Quality Assurance Chemist I

FIELDS OF COMPETENCE

- Analytical Quality Assurance
- Laboratory Compliance Audits
- Environmental Data Validation
- Environmental Laboratory Accreditation
- Continuing Education Training
- Project Management
- Environmental Organic Analyses Methods
- Environmental Inorganic Analyses Methods
- Environmental Wet Chemistry Analyses Methods
- Environmental Microbiology Analyses Methods
- Environmental Radiochemistry Analyses Methods
- Wastewater Process Control
- Wastewater Microbiology

CREDENTIALS

BS Biology, Indiana University of Pennsylvania, Indiana, Pennsylvania, 1984.

BS Chemistry, Duquesne University, Pittsburgh, Pennsylvania, 1986.

CERTIFICATIONS

Certified to provide Water/Wastewater Operator Continuing Education Training in the following states: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Ohio, Virginia, and West Virginia.

SUMMARY OF EXPERIENCE

Mr. Yakub has over 25 years of experience in the environmental field, working first as a laboratory analyst, next as the laboratory's Quality Assurance Officer, and now as an environmental consultant specializing in corporate environmental liability issues.

As an analyst, Mr. Yakub has performed all phases of environmental analyses, including wet chemistry, metals digestion and analyses, mercury digestion and analyses by cold-vapor atomic absorption, volatile organic analyses by purge and trap/GC-MS, semi-volatile organic analyses by extraction /GC-MS, Pesticide and PCB analyses by extraction/GC-ECD, and various microbiological analyses, including membrane filtration, multiple tube fermentation, defined substrate utilization analyses, HPC, microscopic evaluation, Cryptosporidium/Giardia analyses, and wastewater activated sludge diagnostic evaluation.

As Quality Control Officer, Mr. Yakub developed and instituted a complete Quality Assurance/Quality Control Program for the laboratory, including documentation, sample and data handling procedures, chain-of-custody, internal auditing, a performance evaluation program, ethics/data integrity, and data validation.

As an environmental consultant serving the environmental community, Mr. Yakub currently provides laboratory accreditation assistance, laboratory compliance audits, environmental data validation, document preparation and review, and other services to the client. As an auditor, Mr. Yakub has audited over 80 commercial, municipal, and industrial laboratories for compliance with federal and state guidelines, compliance with published methods, and compliance with client technical specifications.

KEY PROJECTS

- Developed and implemented a Total Quality Assurance Program for a large municipal wastewater treatment plant in Pennsylvania.

KEY PROJECTS (Cont.)

- Provided water and wastewater operator continuing education contact hours through seminars, conferences, and special education classes throughout 13 states in the northeastern United States.
- Assisted several large commercial laboratories to meet Environmental Laboratory Accreditation requirements for multiple state jurisdictions.
- Performed compliance audits for laboratories seeking to meet state Environmental Laboratory Accreditation programs.
- Performed laboratory compliance audits for industrial clients to ensure that their contract laboratories meet client requirements for organic and inorganic environmental analyses.
- Assisted an industrial client in the development of laboratory program criteria and the evaluation and selection of contract laboratories that met the criteria.
- Provided Ethics and Data Integrity Education classes to municipal wastewater treatment personnel to meet state requirements.
- Performed a detailed water usage study, suggested system maintenance and usage parameters to reduce the amount of potable water used at a major beef processing/packaging company that resulted in the savings of millions of gallons of potable water.
- Performed environmental data validation of PCB Aroclor, PCB congener, metals, and wet chemistry data for a major PCB environmental cleanup effort in EPA Region II.
- Performed environmental data validation of metals and wet chemistry data for a major fly ash release cleanup in EPA Region IV.
- Performed environmental data validation of metals and organic explosives data for a RCRA site cleanup in EPA Region V (including Ohio EPA Tier I and Tier II Validation protocols).
- Performed environmental data validation of high resolution GC/MS, organics, pesticides, metals, and wet chemistry data on surface water, beach sediments, and fish tissue samples for a major cleanup effort in EPA Region X.
- Performed environmental data validation of polychlorinated dioxins, furans, and polybrominated diphenyl ethers by High Resolution GC/MS for an environmental cleanup effort in EPA Region 4.
- Performed environmental data validation of gasoline and diesel range organics, PAHs, biomarkers, dispersant markers, and wet chemistry data associated with the cleanup of a major oil spill in the Gulf of Mexico.
- Performed environmental data validation of polychlorinated dioxins and furans by High Resolution GC/MS associated with the remediation of a wood-preservative Superfund site in EPA Region IV.
- Performed environmental data validation of Appendix IX Volatiles and Semi-Volatiles, Organic Tentatively Identified Compounds (TICs), Appendix IX Metals and Mercury, Perchlorate, Nitroaromatics and Nitroamines associated with the RCRA cleanup of a former commercial explosives manufacturing site in EPA Region III.
- Performed environmental data validation associated with groundwater monitoring for the environmental remediation of an industrial brownfield site in EPA Region III impacted by arsenic and benzo(a)pyrene.

KEY PROJECTS (Cont.)

- Performed environmental data validation of Appendix IX Volatiles and Semi-Volatiles, Organic Tentatively Identified Compounds (TICs), Appendix IX Metals and Mercury, Formaldehyde, Herbicides, and Pesticides associated with the RCRA Facility Investigation of a chemical manufacturing site in EPA Region III.

- Developed a Laboratory Technical Specifications Manual for a large tobacco corporation to ensure the compliance and uniformity of the laboratory services provided to the client.

- Investigated selenium analysis issues and developed a laboratory protocol for the analysis of low-level selenium in a high-chloride matrix for a major West Virginia coal company.

- Performed audits of major laboratories to assess their analytical capabilities with respect to state-required analyses in support of a major chemical company's exploration and production of natural gas in the Marcellus Shale formation.

- Performed audits of laboratories to assess capabilities and compliance with method requirements in support of coal mining operations and environmental compliance for a major coal energy production company.

PRESENTATIONS

Yakub, G. P. "Laboratory Ethics: An Auditor's Perspective." National Environmental Monitoring Conference (NEMC), San Antonio, TX, August 2013.

STEPHEN T. ZEINER, CEAC
Senior Technical Chemist

FIELDS OF COMPETENCE

- Analytical and environmental chemistry.
- Analytical method specification design and third-party evaluation.
- Corporate laboratory program design, execution, and maintenance.
- Laboratory auditing.
- Performance evaluation study design and execution.
- Project-specific analytical/sampling request for proposal preparation.
- Project-specific quality assurance oversight.
- Purge and trap/GC instrumentation repair and troubleshooting.
- Quality Assurance Project Plan preparation and evaluation.
- Rigorous third-party data validation for RI/FS, RFIs/CMS, Permit B, delisting studies, and CAA stack tests.
- Technical liaison among laboratories, industries, and consultants.
- Theoretical and practical knowledge of all facets of quantitative analysis for organic and inorganic pollutants by published methodologies.
- Air, surface, and bulk sampling using viable and nonviable collection procedures for fungal and other biological analytes.
- Air, surface, and bulk sampling using active and passive sample collection procedures for chemical analytes.
- Indoor air quality investigation/design and execution for chemical and biological contamination and assessment of indoor environments.

CREDENTIALS

B.S., Chemistry, Shippensburg University, Pennsylvania, 1988.

Shippensburg University, Pennsylvania. Graduate Analytical Chemistry Course Work.

CERTIFICATIONS

Certified Environmental Analytical Chemist (CEAC) – National Registry of Certified Chemists (NRCC), Washington, DC.

PROFESSIONAL DEVELOPMENT COURSES

"Certified Level 1 and II Mold Inspector Training." Indoor Environmental Standards Organization. Stevensville, MD. October 26-27, 2002.

"Indoor Air Quality PDC." Philadelphia Section of American Industrial Hygiene Association." Wayne, PA. March 25, 2003.

"Advances in Environmental Mold Issues in Pennsylvania." Lorman Education Services. Lansdale, PA. November 7, 2003.

"Indoor Air Quality From Different Perspectives." Philadelphia Section of American Industrial Hygiene Association. Plymouth Meeting, PA. April 1, 2004.

"Special Topics in Industrial Ventilation for Practicing EHRS Professionals." Philadelphia Section of American Industrial Hygiene Association. Plymouth Meeting, PA. March 14, 2005.

"Indoor Mold in Construction, Health, and Legal Issues." Cook College Continuing Professional Education. New Brunswick, NJ. June 21, 2005.

IAQA Philadelphia Chapter Workshop." Indoor Air Quality Association Philadelphia Chapter. Villanova, PA. December 11, 2009.

"Mold, Allergens, Sampling, and Data Interpretation." Environmental Microbiology Laboratory. Philadelphia, PA. December 12, 2006.

"IAQ/IH Sampling Workshop." EMSL Analytical, Inc. Plymouth Meeting, PA. May 15, 2008.

PROFESSIONAL AFFILIATIONS

American Institute of Chemists – Member
American Industrial Hygiene Association - Philadelphia Section – Member

SUMMARY OF EXPERIENCE

Mr. Zeiner has 22 years of analytical and quality assurance experience. Specifically, he has 2 years of analytical experience performing analyses for organic contaminants in a variety of media by instrumental methods, including research and development of analytical methodologies. As a Senior Technical Chemist, Mr. Zeiner has 20 years of experience in the following fields: indoor air quality (IAQ) investigation design/execution and litigation support; organic, inorganic, radiological, and general chemistry data validation (including specialty analyses such as dioxin/furan data); laboratory audits/evaluations; third-party review and production of Quality Assurance Project Plans (QAPjPs) for remedial investigations/feasibility studies (RIs/FSs); Resource Conservation and Recovery Act (RCRA) Facility Investigation/corrective action plans (RFI/CAP) and remedial actions; design of specialty analytical data package deliverables to accommodate project-specific data quality objectives (DQOs); third-party review and critique of laboratory-prepared analytical methods; specification of quality assurance/quality control (QA/QC) parameters for investigative sampling events; third-party review and critique of laboratory standard operating procedures (SOPs); management of several chemists on large data validation and corporate contract laboratory programs; project cost tracking; review of project invoices; production and evaluation of cost proposals; design of corporate contract laboratory programs; sample collection design; sample collection using a variety of methods; inspection of buildings and interpretation of laboratory results.

Prior to employment at Environmental Standards, Mr. Zeiner was a chemist for a large independent analytical laboratory. He was responsible for performing volatile organic analyses by SW-846 and US EPA 500 and 600 Series Methods using purge and trap gas chromatography (GC) with photoionization (PID), flame ionization (FID), and electrolyte conductivity (ELCD) detectors. His responsibilities included writing laboratory-specific modifications of SW-846 and US EPA methods, writing and updating SOPs, designing and implementing a comprehensive repair and preventive maintenance program, and training 16 chemists in the repair and performance of preventive maintenance procedures for purge and trap/GCs. In addition, he researched and developed a laboratory method for the application of purge and trap/GC techniques for separation and detection of non-halogenated/non-aromatic volatile organic compounds.

KEY PROJECTS

- Served as part of the emergency response team for an oil spill in the Gulf of Mexico. Served as Data Validation Task Manager and provided technical support for the Quality Assurance oversight efforts. The project included thousands of samples collected and analyzed for a wide variety of analytes. The project team coordinated with multiple laboratories, consultants, and governmental agencies to facilitate the collection, submission, analysis, and reporting of the analytical data. The data collected were utilized for forensic analysis of the data and for risk assessments. The data validation effort included both Stage 2A and Stage 4 validation efforts.

- Performed an in-depth on site audit of the Quality Assurance/Quality Control system at the Umatilla Chemical Agent Disposal Facility in Umatilla, Oregon. This audit required an understanding of the acceptable exposure limits and analytical challenge program required by the U.S. Army Chemical Management Agency for Near Real Time Automatic Continuous Air Monitoring Systems (ACAMS) and Depot Area Air Monitoring Systems (DAAMS) historical and confirmatory analyses. The audit required an understanding of appropriate Conditions of Operations, the Laboratory Analysis Monitoring Plan, the Laboratory Quality Control Plan, and the Standard Operating Procedures for the Analytical Laboratory Department and the Air Monitoring Department.

KEY PROJECTS (Cont.)

- Performed analytical data validation for numerous site investigations to determine analytical data outliers and data quality/usability. Data were reviewed according to US EPA Contract Laboratory Program (CLP) protocols, SW-846 Methods, Methods for the Chemical Analysis of Water and Wastes, and the US EPA Series 200, 500, and 600 Methods.

- Conducted on-site audits of numerous environmental analytical laboratory facilities. The on-site audits included evaluations of the laboratory's sample log-in and receipt procedures, organization, sample preparation methods, analytical expertise and method compliance, QA/QC procedures, logbook documentation procedures, data package preparation procedures, and results reporting and review procedures. Co-authored detailed audit reports that included descriptions of the laboratory procedures and recommendations for improvements.

- Designed and conducted an IAQ sample collection at a 200,000-square foot elementary school in support of a Pennsylvania Act 2 cleanup of a large #2 fuel oil release. The multi-round sampling events included the collection of air samples using Summa® cannisters for collection of volatile compounds and XAD-2 resin tubes for collection of semivolatile compounds. The results of the air samples were utilized to reopen the school and monitor for any vapor intrusion.

- Provided IAQ and mold consulting support in conjunction with the renovation of a hotel with three towers and nine stories per tower. The IAQ consulting support included inspections of the building; development of the fungal remediation scope-of-work; communication support for workers and owners; design of remediation goals and sample collection points; collection of air samples for mold spores; and collection of surface samples for mold spores. The reports were utilized to assess post-remediation completeness and were presented to the subcontractors and other interested parties as documentation of activities and completion of the fungal remediation.

- Conducted peer review of the Second Edition of the Standard and Reference Guide for Professional Mold Remediation S520 (published by the Institute of Inspection, Cleaning and Restoration Certification Standard [IICRS]).

- Conducted mold investigation for 12,000-square foot building as part of a post-remediation evaluation and in response to continued employee complaints. The investigation included visual inspection of the building and collection of air samples. The report was presented to the employees to document that the mold remediation had been effective.

- Designed and conducted an IAQ investigation of a single-story 20,000-square foot office building in response to complaints by a Fortune 500 Company's employees. The IAQ investigation included visual inspection of the building, interview of management and staff, and collection of air samples for mold spores and dust. The report was presented to the employees to document the conditions in the building.

- Designed and conducted a mold investigation that included four buildings of various sizes in response to a flood event. The mold investigation included visual inspection of the buildings and collection of air samples for mold spores. The report was utilized to assist in the preparation of cleanup plans as well as an assessment of continued building use.

- Designed and conducted a mold investigation of a 5,000-square foot home and litigation support in defense of our client. The mold investigation included review of prior inspection sampling reports, visual inspection of the home, and collection of viable air and surface samples. The report was utilized to generate an expert report in support of our client's claims.

- Served as Analytical Data Quality Manager and client contact for a Fortune 500 industrial client. As part of a corporate laboratory program integrated with data management, duties included on-site training, assistance to address project analytical problems, analytical laboratory recommendations, audit coordination, performance evaluation sample study coordination, invoice review, and development and maintenance of program documents.

KEY PROJECTS (Cont.)

- Served as part of the environmental chemistry team to support defense litigation for a site whose main analyte of concern was technical chlordane. Responsibilities included evaluation of historical data, validation of current data, and production of expert reports. The evaluation of technical chlordane included research into the production and production specifications of technical chlordane.

- Provided IAQ and mold consulting support for owner of a two-story 200,000-square foot building. The IAQ consulting support included review of previous IAQ report, collection of air samples for mold spores, collection of surface samples for e.coli and fecal coliform, inspections of the building, and participation in meetings with tenant representatives. The reports were utilized to assess post-remediation completeness and were presented to the tenant as documentation of activities.

- Served as a Project Manager and provided quality assurance support to a Fortune 500 industrial client for a US EPA Region IV site investigation. Served as contact point for analytical performance and data quality issues, managed chemists performing data usability assessment on aqueous samples, and facilitated database modification.

- Served as data validation Project Manager for US EPA Region II and NYS DEC site investigations. Duties included data log-in and tracking, assisting in technical data validation problems, reviewing quality assurance reports, tracking budgets for data package review, and providing technical assistance to clients.

- Designed and conducted IAQ sample collection at a 3,000-square foot two-story residence in support of a Pennsylvania Act 2 cleanup of a #2 fuel oil release. The multi-round sample events included the collection of air samples using Summa® canisters for collection of volatile compounds and XAD-2 resin tubes for collection of semivolatile compounds. Provided consulting support for client in dealing with the resident. The reports were utilized to assess the condition of the IAQ, monitor for vapor intrusion, and document the effectiveness of the subslab remediation system.

- Served as Project Manager for the development of a corporate contract laboratory program that included a Laboratory Users/Corporate Quality Assurance Guide. Developed a written survey to collect project information from approximately 80 client sites. Designed a client-specific Request for Proposal (RFP). Additionally, laboratory audits were performed on the short-listed laboratories, and the laboratory proposals were evaluated and ranked.

- Served as a Project Manager and provided quality assurance support to a Fortune 500 industrial client for a Texas RFI. Served as contact point for analytical performance and data quality issues, managed chemists performing data usability assessment on solid and aqueous samples, and facilitated database modification.

- Served as a Project Manager and provided technical support for a major Alaskan oil pipeline company for all remediation and monitoring activities conducted by the company. Served as a contact point for validation requests and managed chemists performing data validation on solid, aqueous, and waste sample data.

- Served as a Project Manager and provided technical support to a Fortune 100 industrial client for a US EPA Region II RI/FS. Served as contact point for technical questions regarding data quality issues and managed chemists performing data validation on solid and aqueous sample data.

- Served as Project Manager for a preliminary NYS DEC site investigation for Aroclor characterization. Responsibilities included the preparation of a Request for Quotation (RFQ), review and evaluation of proposals, preparation of data package deliverables that were required for the project-specific analytical protocol, and performance of a laboratory audit of the selected project laboratory.

- Served as part of the peer-review team for the US EPA Region I volatile organic, semivolatile organic, and pesticide/PCB data validation guidelines.

KEY PROJECTS (Cont.)

- Served as an on-site technical consultant to three laboratories. Duties included the review of data package deliverables prior to issuance and the review of analytical data for accuracy and adherence to volatile organic, semivolatile organic, and inorganic method protocols.

- Served as data validation Project Manager and provided quality assurance support for a Metals Parts Furnace Halogenated Wastes and Carbon Micronization System with Deactivation Furnace System Performance Tests portions of a trial burn. Validated liquid, solid, and air samples that were analyzed for particulate matter, hydrochloric acid, chloride, hydrofluoric acid, trace metals, total organics, polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans, volatile and semivolatile products of incomplete combustion, and PCB congeners. Assisted the client and project laboratory to establish the requirements for a fully documented data package. Provided interface among Environmental Standards, the client, and project laboratory for resolution of technical issues.

- Served as part of a project team for the review and comparison of US EPA stack testing methodologies and European stack testing methodologies for polychlorinated dibenzodioxin/polychlorinated dibenzofuran.

- Provided data validation services for an RFI at a major aircraft corporation. Reviewed PCDD/PCDF, volatile, semivolatile, and pesticide/PCB compounds for several data package delivery groups. Prepared reports and performed secondary review of reports and data tables for several additional packages.

- Developed an RFQ that included the analytical specifications and QA/QC procedures necessary for laboratories to perform work and to accurately bid work under the client's environmental contract laboratory program. The laboratories were also requested to provide additional technical information for review by Environmental Standards.

- Co-authored and managed the development of an Environmental Contract Laboratory Program – Analytical Services and Quality Assurance Guidance Manual, which included information useful both to the client's staff for project planning and to the laboratory's staff for sample analysis and data package generation. Topics in the manual included analytical methods, data package specifications, communication schemes, DQO options, QA/QC procedures, corrective actions, and electronic deliverable specifications.

- Served as part of a team that audited and evaluated several laboratories' sample log-in and receipt procedures, organization, sample preparation methods, analytical expertise and method compliance, QA/QC procedures, documentation procedures, data packaging procedures, and results reporting methods. Co-authored detailed audit reports that included descriptions of the laboratories' procedures. A ranking report based on the technical aspects evaluated during the audits was provided to the client.

- Served as part of a team that provided data management for a major gas pipeline company spanning nine states in the eastern United States.

PUBLICATIONS

Zeiner, S. T., R. L. Forman, M. M. Burcham, and M. Cohen. "A Comparative Evaluation of Quality Control Results." The Chemist, Vol. 77, No. 6 (November/December 2000).

Zeiner, S. T. Book Review of "A Case for Wetland Restoration" by Donald L. Hex, Ph.D., and Nancy S. Philippi. The Chemist, Vol. 77, No. 2 (March/April 2000).

Zeiner, S. T. Book Review of "A Practical Guide to Graphite Furnace. Atomic Absorption Spectrometry" by D. Butchar and J. Sheddon. The Chemist, Vol. 75, No. 5 (November/December 1998).

Zeiner, S. T. "HazWaste World/SUPERFUND XVII." The Chemist, Vol. 73, No. 6 (November/December 1996).

PRESENTATIONS/POSTERS

Zeiner, S. T., A. Powley, and J. Pawlish. "Evaluation of Aqueous Field and Equipment Blank Data and the Associated Solid Samples." 28th Annual International Conference on Soils, Sediments, And Water. Amherst, MA, October 15-18, 2012.

Zeiner, S. T. and K. Harsh "Native or Contamination? All A Matter of Perspective!" National Environmental Monitoring Conference. Washington, DC, August 6-9, 2012.

Zeiner, S. T. "What Do You Do With Field Duplicates? – Case Studies on Usability Assessment and Application to Site Investigations." National Environmental Monitoring Conference. Washington, DC, August 10-15, 2008.

Zeiner, S. T. "Apples, Oranges, and SW-846 – National Functional Guidelines Revision Critique." National Environmental Monitoring Conference. Washington, DC, August 10-15, 2008.

Zeiner, S. T., R. J. Vitale, D. P. Callaghan, and J. Kraycik. "Assessment and Interpretation of Field Duplicates – A Case Study of a Complex Sediment Investigation." 22nd Annual International Conference on Soils, Sediments, And Water. Amherst, MA, October 16-19, 2006.

Zeiner, S. T., R. L. Forman, and D. R. Blye. "Application of Electronic Data Verification With Data Validation to Site Characterization Projects to Maximize Efforts." National Environmental Monitoring Conference. Washington, DC, July 25-29, 2005.

Zeiner, S. T., E. T. Lahr, and R. J. Vitale. "Perchlorate: Utilization of Ion Chromatography and Liquid Chromatography on Characterization Project." National Environmental Monitoring Conference. Washington, DC, July 25-29, 2005.

Zeiner, S. T. "Your Indoor Environment." Spring-Ford Chamber of Commerce. Limerick, PA, May 26, 2005.

Zeiner, S. T., "Indoor Air Quality (IAQ)/Mold Seminar." King of Prussia, PA, April 7, 2004, and Allentown, PA, June 22, 2004.

Zeiner, S. T., D. J. Lancaster, D. R. Blye, and J. N. Schott. "Evaluating Calibration Model Reliability." National Environmental Monitoring Conference. Washington, DC, July 19-23, 2004.

Zeiner, S. T. and R. L. Forman. "The Combined Power of Electronic Data Verification and Data Validation for Site Characterization and Remediation." National Environmental Monitoring Conference. Arlington, VA, July 21-24, 2003.

Zeiner, S. T., D. J. Lancaster, and R. J. Vitale. "Negative Effects of the 'Grand Mean' Calibration Approach on Generated Internal Surrogate Compound Recovery Limits." Waste Testing and Quality Assurance Symposium. Arlington, VA, August 12-16, 2001.

Zeiner, S. T., R. L. Forman, M. M. Burcham, and M. Cohen. "Comparison of Laboratory Duplicate, Matrix Spike, and Field Duplicate Results for Lead, Chromium, Nickel, and Barium in a Multi-State Pipeline Investigation." Pittsburgh Conference, Orlando, FL, March 7-12, 1999 and American Institute of Chemists 76th National Meeting, Arlington, VA, June 1-3, 2000.

Zeiner, S. T. "Site Characterization Planning: The Importance of Quality Control Samples." American Institute of Chemists 75th National Meeting. Philadelphia, PA, May 28-30, 1998.

Zeiner, S. T. "Realistic Criteria for the Evaluation of Field Duplicate Sample Results." SUPERFUND XV. Washington, DC, November 29-December 1, 1994.

CONFERENCE MODERATOR/CHAIR

Zeiner, S. T. Chairperson. "Brownfields: State and Local Lessons." HazWaste World/SUPERFUND XVIII. Sheraton Washington Hotel, Washington, DC, December 2-4, 1997.

APPENDIX B

PDI Community Air Monitoring Plan (CAMP)

PDI COMMUNITY AIR MONITORING PLAN
REMEDIAL DESIGN WORK PLAN
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

by

Haley & Aldrich of New York, Inc.
Rochester, New York

for

Atlantic Richfield Company

File No. 28612
September 2013

HALEY & ALDRICH

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1. INTRODUCTION

This Pre-Design Investigation (PDI) Community Air Monitoring Plan (CAMP) describes the perimeter air monitoring to be conducted during remedial design activities at the former Anaconda Wire and Cable Plant site in the Village of Hastings-on-Hudson, New York. Perimeter air monitoring will be conducted during all ground intrusion activities. Monitoring activities are designed to meet the project objectives defined in Section 2.0 of this CAMP and will conform to the NYSDOH Generic Community Air Monitoring Plan (NYSDOH, June 2000) and Occupational Safety and health Administration (OSHA) regulations promulgated under 29 CFR 1910.120.

During the implementation of this CAMP, steps will be taken that will prevent and reduce fugitive dust emissions and to ensure proper precautions are taken to protect human health to the surrounding community during remedial design activities at the site. This CAMP includes Polychlorinated Biphenyls (PCBs), Volatile Organic Carbon (VOCs) and particulate air monitoring to assess if fugitive particulates are leaving the site during ground disturbance activities. The details of the dust control and air-monitoring program are described in the following sections of this CAMP.

1.1 Project Objectives

There are four primary objectives of this CAMP. These overall project objectives are to:

- Help protect human health and the environment;
- Use real-time monitoring results in conjunction with worker health and safety programs;
- Evaluate the effectiveness of, and need for, additional dust suppression controls; and
- Document air quality during site activities.

The specific air monitoring and data quality objectives are outlined below.

1.2 Community Air Monitoring Program Overview

Monitoring under this CAMP should be completed as outlined below.

- The first phase of sampling will establish baseline or background concentrations at the site prior to ground disturbance activities. Baseline conditions will be determined utilizing real-time and laboratory data that will be collected at least 2 days before the start of work.
- The second phase of sampling will be conducted during ground disturbance tasks to document ambient air conditions at the site perimeter and to compare these conditions to the established action level criteria for the site. This will include real-time air sample collection for the documentation of general and transient conditions assessment during ground intrusion activities.

Particulate data will be collected from two locations on the site perimeter, one upwind and one downwind, of the ground disturbance activities. PCB collection will occur downwind of the ground disturbance activities. The location of the two air monitoring locations may change from day to day depending on site activities and meteorological conditions. This monitoring will be conducted utilizing direct reading aerosol (particulate) and continuous flow monitoring devices. In addition to the field screening indicator measurements or observations, meteorological parameters consisting of wind speed, wind direction, sigma theta, temperature and relative humidity will be monitored.

On-site air quality action levels are summarized in the table below:

	Particulate Matter	PCBs (per Aroclor)	VOCs
PDI Activity	During ground disturbance activities	During ground disturbance activities	During ground disturbance activities except for concrete coring
Action Level	100 $\mu g/m^3$ greater than background	0.11 $\mu g/m^3$	5 ppm greater than background
Response	Implement suppression techniques	Implement suppression techniques	Take samples more often, implement engineering controls
Stop Work Limit	150 μg/m3 greater than background for 15 minute average with suppression techniques in place or visible fugitive dust leaving the site	Not Applicable	25 ppm at the perimeter of the work area
Sampling Period	15 minute average	8 hrs	15 minute interval
Sampling Method	Data RAM	EPA Method TO-10A using Sorbent, Polyurethane Foam	PID or 5 gas meter
Location	Upwind & Downwind	North and South end of B52 for north test pits & downwind for south test pits	Workzone (downwind)

2. AIR QUALITY CONTAMINANTS OF CONCERN

PDI activities associated with remedial investigation of the Site have the potential to generate chemical risk to the health of nearby off-site receptors through inhalation exposures to the contaminants of concern (COC) in the air-borne particulates.

2.1 Polychlorinated Biphenyl's (PCBs)

Polychlorinated biphenyl's (PCBs) are a group of manufactured organic chemicals that contain 209 individual chlorinated chemicals (known as congeners). PCBs are either oily liquids or solids and are colorless to light yellow in color. They have no known smell or taste. There are no known natural sources of PCBs. Some commercial PCB mixtures are known in the United States by their industrial trade name, Aroclor.

PCBs do not burn easily and are good insulating material. They have been used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. The manufacture of PCBs stopped in the United States in 1977 because of evidence that they build up in the environment and cause harmful effects. Products containing PCBs are old fluorescent lighting fixtures, electrical appliances containing PCB capacitors, old microscope oil, and hydraulic fluids. OSHA limits the concentration of PCBs in workroom air to 1 mg/m3 for PCBs with 42% Cl and 0.5 mg/m3 for PCBs with 54% Cl.

3. PERIMETER AIR MONITORING

The perimeter air monitoring system is intended to produce sufficient information for controlling the potential risk from fugitive emissions on an on-going basis. The sampling program is designed to provide real-time air monitoring so that acceptable risks for acute and subchronic exposures are not exceeded. Perimeter monitoring for particulate matter (fugitive dust) will comply with NYSDOH CAMP requirements found in DER-10.

3.1 Field Screening Methods

Data for the particulate instrument will be collected at two locations, one upwind and one downwind of the ground disturbance activities.

An aerosol meter will be used to provide screening results for particulate matter. This direct reading instrument (the DataRAM, or equivalent) has a measurement range from 0.001 to 400 mg/m3, and provides appropriate sensitivity for site applications.

These direct reading instruments will be calibrated on a daily basis and maintained in accordance with the manufacturer's specifications. All real-time monitoring data will be logged. Data records will be referenced to Site location, time and date of reading, and the initials of the field technician. The monitoring information will be downloaded and reviewed with the documentation package to ensure the airborne levels at the Site perimeter are less than the established Site action levels.

Ambient air at the upwind and downwind locations will be measured on a continuous basis and reported as 15-minute averages. If ambient air concentrations at the downwind site is 100 μg/m3 above background (as measured at the upwind site) for a 15-minute period, or if airborne dust is observed leaving the work site, dust suppression activities will be employed. Work activities will be continued during dust suppression provided that the downwind levels do not exceed 150 μg/m3 above background and provided that no visible dust is migrating from the work site.

If after implementation of dust suppression techniques, downwind levels are greater than 150 μg/m3 above the upwind level, work will cease and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind concentration to less than 150 μg/m3 of the upwind level for 15 minutes and in preventing visible dust from migrating beyond the work site.

Meteorological parameters consisting of wind speed, wind direction, temperature and relative humidity will be monitored continuously onsite and reported as 15-minute averages.

3.2 Constituent Specific Monitoring

A full characterization of air quality requires the performance of additional constituent-specific sampling to verify that the Site action levels and engineering controls are protective of human health.

3.2.1 Sampling Location and Frequency

Perimeter monitoring will include two locations, one upwind and one downwind of the construction activities. Both upwind and downwind wind directions will be pre-established each day by collection of actual site-specific meteorological data at a representative location on site. Perimeter monitors will be placed as close to the property line as feasible, such that other sources of fugitive dust between the sampler and the property line are minimized. Upwind and downwind locations will be monitored simultaneously. Samples will be collected during the active working period on the site for each day that activities are conducted, generally during the hours of 7 AM to 5 PM. Pumps will be installed at air monitoring stations established at two locations. The pumps pull ambient air through analytical detector tubes at a constant flow rate. The devices, approximately 4 to 6 feet above ground, will be deployed at the beginning of each day prior to any ground disturbance activities taking place. The continuous sampling devices will be removed at the end of the workday, and the samples sent off site for laboratory preservation and analysis. All samples collected will be sent to the laboratory at the end of each day of monitoring.

The locations of monitoring devices should generally remain the same throughout the program, but may be modified during activities due to the location, nature and intensity of site activity. Modifications of monitoring locations shall be documented.

3.2.2 Constituents of Interest

PCBs:

Constituents of Interest	Action Level	Base Detection Limit*	Sampling Method	Media	Sampling Period
PCBs	0.11 $\mu g/m^3$	0.1 $\mu g/m^3$	EPA Method TO-10A	Sorbent, Polyurethane Foam	8 hrs

*Actual detection limit would be 0.04 $\mu g/m^3$ based on a run time of 8 hrs at 5 l/min.

The meteorological data will be evaluated and used to select the sample location for the down wind sample for each day of monitoring. Depending on wind direction relative to Building 52 and location of ground disturbance, one additional location will be added to measure air flows that are diverted around the structure.

At the conclusion of each sampling day or event, the sample pumps will be removed from their monitoring locations, the sampling tubes will be removed from the inlet tubing, the individual cartridge will be labeled with the monitoring location identification number, date, and total monitoring time, and then be refrigerated or placed into an approved shipping container. Chain-of custody forms will be completed and shipped with the samples to the analytical laboratory. When completing the chain-of-custody forms, the sampling technician will identify the specific analytes to be analyzed.

Sampling during soil borings will be completed daily for at least the first 3 days and the frequency may be adjusted based on type of ground disturbance, sample results and discussions with the DEC and DOH (e.g. once every 3 to 5 days). Sample turn-around time will initially be prioritized and adjusted based on type of ground disturbance, sample results and discussions with the DEC and DOH.

Reporting of sampling events will include meteorological data, and the presence of potential sources of the COI.

Pace Laboratories will be used for all sample analysis.

Volatile Organic Carbon (VOCs):

VOC monitoring will be done in the work zone or other downwind location as required, details of which are documented in the Haley & Aldrich Site Specific Health and Safety Plan (HASP) for onsite workers.

3.3 Equipment

3.3.1 SKC Leland Legacy Sample Pumps

PCBs air samples will be collected using SKC Leland Legacy Sample Pumps (SKCs) or equivalent. SKCs will operate at a flow rate of approximately 5 l/min for the collection air samples. PCBs will be sampled using a 20-mm x 7.6 cm polyurethane foam (PUF) cylinder, fitted under slight compression inside a glass cartridge.

<u>Operation</u>

After individual calibration of each pump/cartridge combination, samples will be placed at selected locations, at heights generally 4 to 6 feet above ground surface. Pumps will be checked during the day, to verify proper operation.

At the end of the day, the total accumulated time as registered on the pump run time clock will be compared with the times calculated from the recorded start/end times. If consistent, the time noted on the pump will be used to calculate the total volume sampled by the pump according to:

Total minutes (min) x flow rate (l/min) = total volume (l)

<u>Calibration</u>

Each pump cartridge combination will be individually calibrated using a SKC calibrator. Pumps will be calibrated at the beginning and end of each day and the arithmetic mean of the two measurements will be used to calculate the flow rate and, from that, the total volume.

3.3.2 The DataRAM (pDR-1000AN)

Real time monitoring of particulates will be conducted using a DataRAM or equivalent device. The DataRAM monitor provides essentially real time analyses of particle matter less than 10μm in diameter using internally mounted precision spaced pulsed laser beams for quantification. Air enters the sampling cavity by diffusion and by the passing of ambient air over and around the instrument. Output is in mg/m^3 with a detection limit of 1μg/m^3 declared by the manufacturer.

3.3.3 Meteorological Station

Meteorological data will be recorded using a Weather Monitor II from Davis Instruments or equivalent device. Pertinent parameters with respect to the CAMP will be recorded and primarily include wind direction and high maximum wind speed.

3.4 Documentation

The instruments will be calibrated at the beginning of each workday and the time of day and name of field personnel will be recorded. In addition, weather conditions at the site will be recorded each day. Measurements will be documented for each reading at all designated monitoring locations.

The following information will be recorded for each instrument reading:

- Date and time of reading;
- Reading location;
- Concentration reading; and
- Ground disturbance activities

3.4.1 Sample Custody

For each sample that is collected, an entry will be made on a chain-of-custody form. The information to be recorded includes the sampling date and time, sample identification number, matrix type, requested analyses and methods, preservatives, and the sampler's name. Sampling team members will maintain custody of the samples until they are relinquished to laboratory personnel or a professional courier service. The chain-of-custody form will accompany the samples from the time of collection until received by the laboratory. Each party in possession of the samples (except the professional courier service) will sign the chain-of-custody form signifying receipt. The chain-of-custody form will be placed in a plastic bag and shipped with samples packaged with ice. A copy of the original completed form will be provided by the laboratory along with the report of results. Upon receipt, the laboratory will inspect the condition of the sample containers and report the information on chain-of-custody or similar form.

3.5 Quality Assurance/Quality Control (QA/QC)

The quality assurance and quality control (QA/QC) procedures proposed for this program are described in this section. The QA/QC procedures associated with the air quality measurements program are designed to evaluate and ensure the accuracy and precision of monitoring methods.

3.5.1 Particulate Monitors

The DataRAM will be used to continuously monitor particulate emissions at the upwind and down-wind (or work area) locations. At a minimum, the DataRAMs will be field checked daily using zero calibration air. At the beginning of each workday, when site intrusive activities take place, a calibration check will be performed on each unit at the measurement location. Two calibration points will be checked to determine instrument performance. A zero (or particulate-free) test sample, using the appropriate particulate filter supplied by the manufacturer for this purpose, will be placed over the sample inlet. The data output for the MIE DataRAM will be observed and the response recorded in the field logbook. An upscale calibration point will also be check by activating the "on-board" calibration feature. This procedure activates a light-emitting diode to simulate one upscale particulate concentration value. The results will be recorded in the field logbook and maintained on-site throughout the duration of site activities. Instrument calibration procedures will be conducted according to the manufacturer's recommendations.

If the field technician determines that the instrument has a problem, the unit will be repaired or replaced, whichever takes less time. During the latter part of the workday each air quality measurement device will be QA/QC checked. If a system fails the QA/QC procedure and cannot be quickly corrected, the site manager will be immediately notified. The site technician will then take immediate measures to remedy the situation.

3.5.2 Meteorological Measurement System

The on-site meteorological system will continuously measure and report the parameters listed in Section 1.2 of this plan. QA/QC and calibration procedures will follow the manufacturer's recommendation for meteorological systems. A calibration of each parameter will be conducted on-site at the time of installation of the meteorological tower system and at the end of the program. The calibration results will be noted in the on-site field logbook and provided in the project report.

4. DATA SUMMARIES

4.1 Data Summaries

Daily data summaries will be prepared to document the field screening results for the day. The summaries will include the locations monitored, hourly measured results, the date and time of the reading, location-specific observations, weather conditions, site activities related to air quality, and the daily maximum value and daily average value for each day. Monitoring results will be summarized as they become available and results will be maintained on site.

5. CORRECTIVE ACTIONS

Based upon perimeter particulate monitoring data described in the previous sections and/or visual observation, the need for dust suppression procedures will be determined by the Site Health and Safety Officer. The documents, which will serve as guidance for the implementation of dust control procedures, are the AQMD Rule 403, the NYSDOH CAMP (NYSDOH, June 2000) and DER-10. The work area will be conducted in a manner that reduces the potential to generate dust and particulates from being generated. Based on the guidance from these documents the following techniques may be employed to mitigate the generation and migration of fugitive dust during remediation activities:

1. Reduce the pace of, or cease, dust producing activity until the problem is corrected.

2. Notify the area supervisor of dust conditions and implement dust suppression procedures.

3. Remove accumulated dirt and soil from problematic areas, and/or cover, enclose, or isolate dust generating areas/surfaces to shield them from the wind.

4. Increase frequency, volume, and/or coverage of water misting, sprays, and foggers to prevent soil and dirt from drying.

5. Provide additional dust suppression systems and any required operating personnel during the task duration.

6. Modify operating procedures and methods to eliminate problematic conditions.

7. Increase level of worker awareness and instruct them on implementation of any new or modified operating procedures.

8. Report and document all procedural modifications and results.

9. Perform routine audits of dust suppression methods and work areas for dust sources.

If, after implementation of dust suppression techniques, downwind particulate levels are greater than 150 μg/m3 above the upwind level and visible dust is noted, work will be suspended until appropriate corrective measures are identified and implemented to remedy the situation.

REFERENCES

1. Air Quality Management District (AQMD). 2001. Rules and Regulations. http://www.aqmd.gov/rules/rulesreg.html.
2. Haley & Aldrich, Inc., 2001. Hammond Air Monitoring Plan, Hammond Indiana.
3. ENSR Corp and Haley & Aldrich of New York, 2005. Community Air Monitoring Workplan for Predesign Field Investigation Services, Operable Unit 1, Former Anaconda Wire and Cable Plant Site, Hastings On Hudson, New York.
4. Haley & Aldrich, Inc., 2008. Air Monitoring Work Plan for Remediation of Area of Interest, Old Fort Wayne Former MGP Site, Fort Wayne, Indiana.
5. Haley & Aldrich of New York, Inc., 2009. Air Monitoring Plan, Decommissioning and demolition of Buildings 51, 51A, 72, 72A, 22, 22A, 22B, 22C, 57, 17, and remnants of 15. Atlantic Richfield Company, Hastings on Hudson, New York.
6. New York State Department of Health Generic Community Air Monitoring Plan.
7. DER-10 / Technical Guidance for Site Investigation and Remediation (DER-10), New York State Department of Environmental Conservation. Office of Remediation and Materials Management. May, 2010.

APPENDIX C

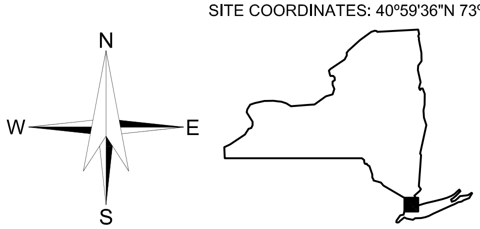
Site Figures

Appendix C Figures from OU-2 ROD

March 2012, Record of Decision, Harbor at Hastings, Operable Unit No. 02: Hudson River Sediments, State Superfund Project, Hastings-on-Hudson, Westchester County, Site No. 360022, NYSDEC

Figure 1. Site Locus
Figure 2. Site Features
Figure 5. Extent of PCB in Sediments
Figure 6. Metals $>95^{th}$ Percentile Background Concentration
Figure 7. Plan View Modified Alternative 6

SITE COORDINATES: 40º59'36"N 73º53'9"W



U.S.G.S. QUADRANGLE: HASTINGS-ON-HUDSON, NEW YORK

HALEY & ALDRICH

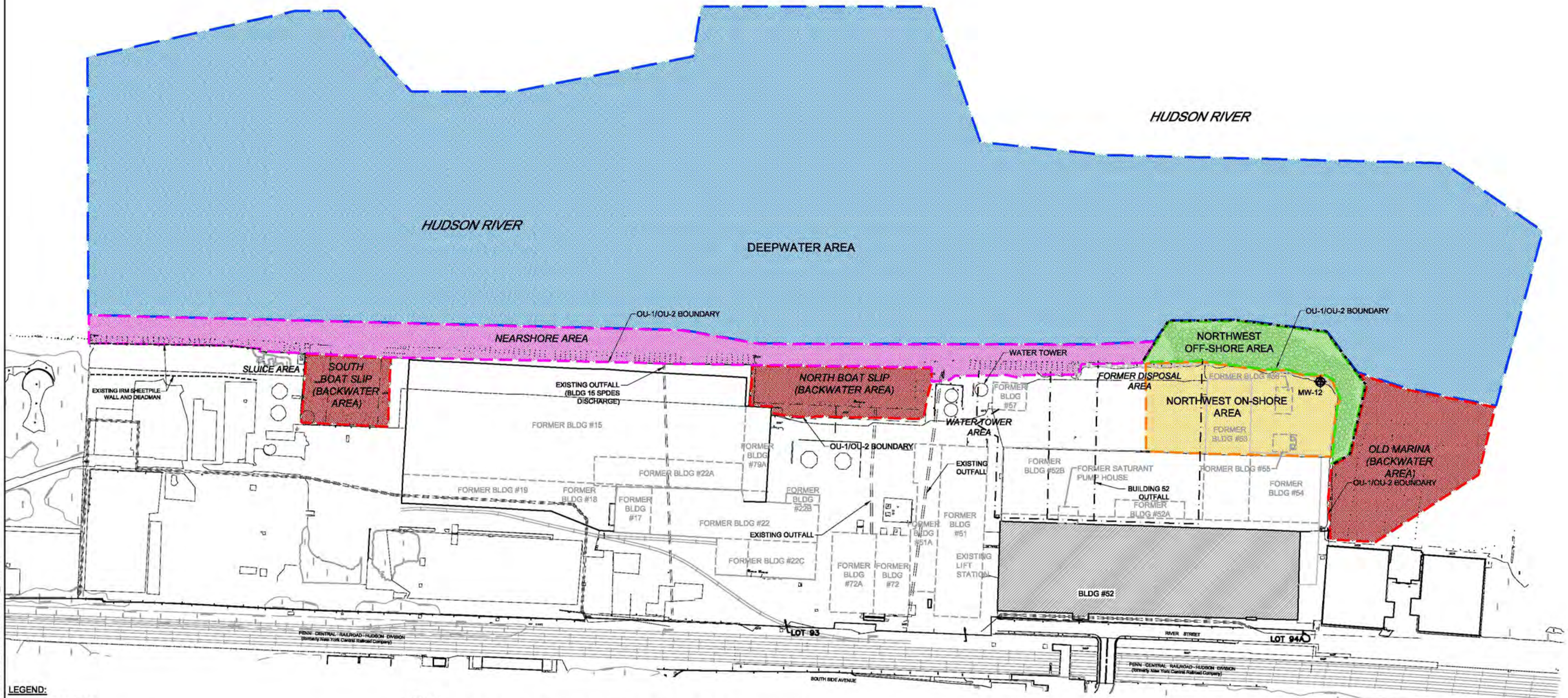
NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

Site Locus

SCALE: 1:24000
MAY 2011

FIGURE 1

G:\PROJECTS\28612\250 - RFI\CAD\PLAN VIEWS & SECTIONS\28612-LOCUS_D1.DWG



G:\PROJECTS\28612\250 - RFS\CAD\PLAN VIEWS & SECTIONS\28612-OU-2 SITE PLAN_D2.DWG

LEGEND:

- RAIL ROAD
- EXISTING STRUCTURES
- RIP-RAP
- BUILDING 52 OUTFALLS
- EXISTING OFFSITE OUTFALLS
- MONITORING WELL
- DEEPWATER AREA
- NEARSHORE AREA
- NORTHWEST OFF-SHORE AREA
- NORTHWEST ON-SHORE AREA
- BACKWATER AREA

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. OTHER SITE FEATURES BASED ON VARIOUS HISTORICAL DOCUMENTS.
3. NUMEROUS MONITORING WELLS ARE LOCATED ON SITE. HOWEVER, ONLY MW-12 IS SHOWN AS IT IS THE FIRST LOCATION WHERE LIQUID PCB MATERIAL WAS OBSERVED.
4. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS.
4. THE OU-2/OU-1 BOUNDARY IS LOCATED AT THE MHW.

0 200 400
SCALE IN FEET

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

Site Features

SCALE: AS SHOWN
MAY 2011

FIGURE 2

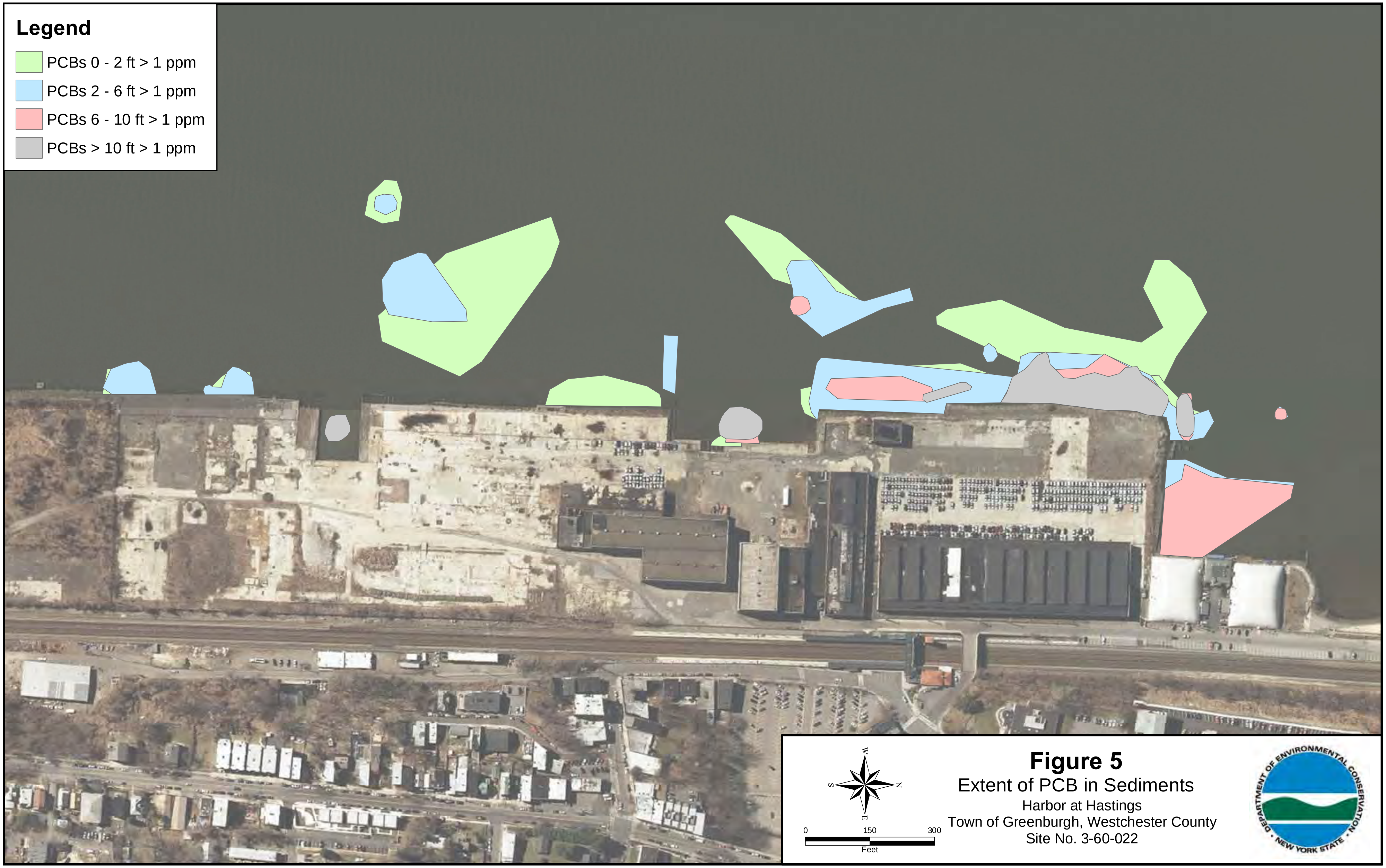


Figure 5
Extent of PCB in Sediments
Harbor at Hastings
Town of Greenburgh, Westchester County
Site No. 3-60-022

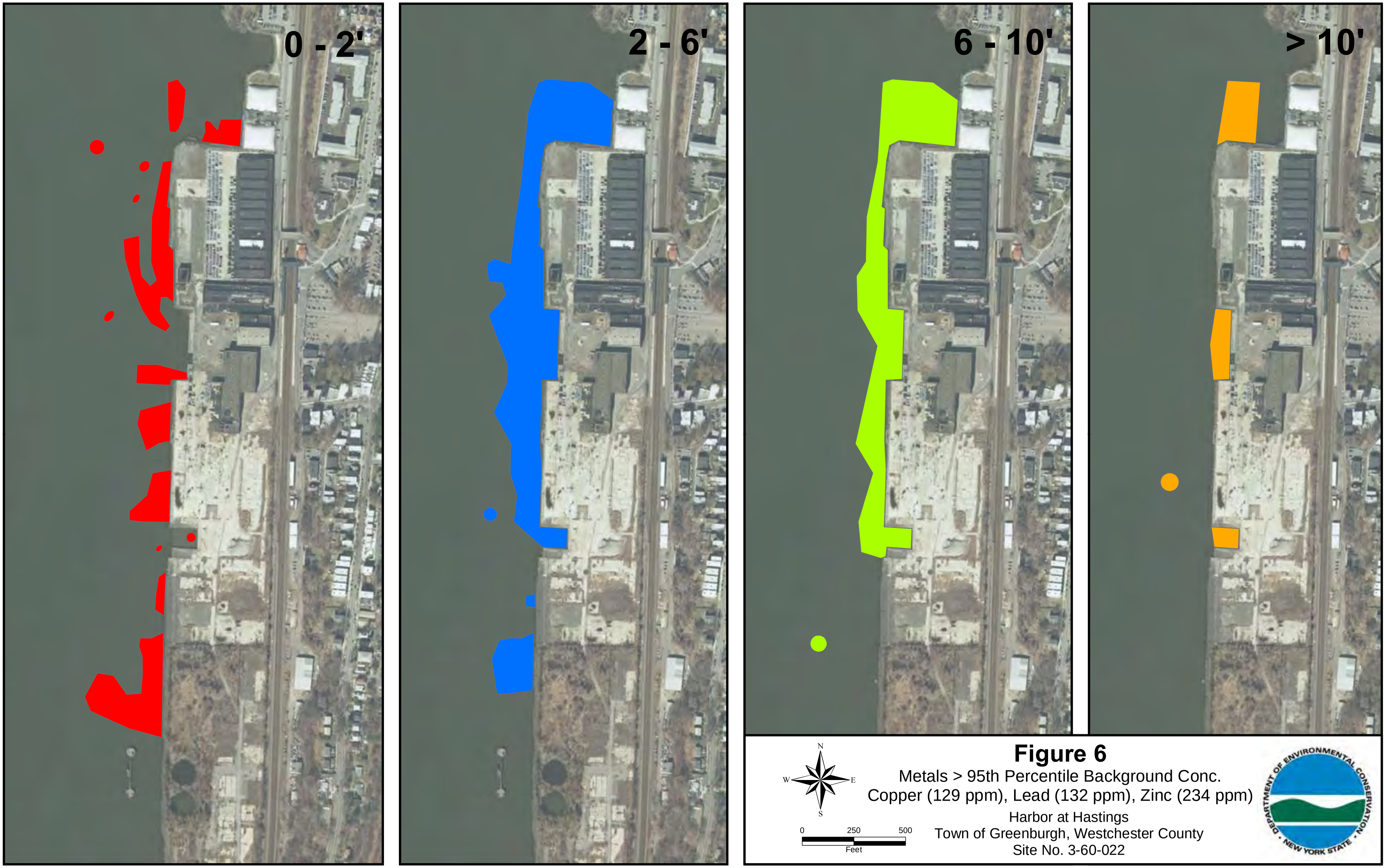
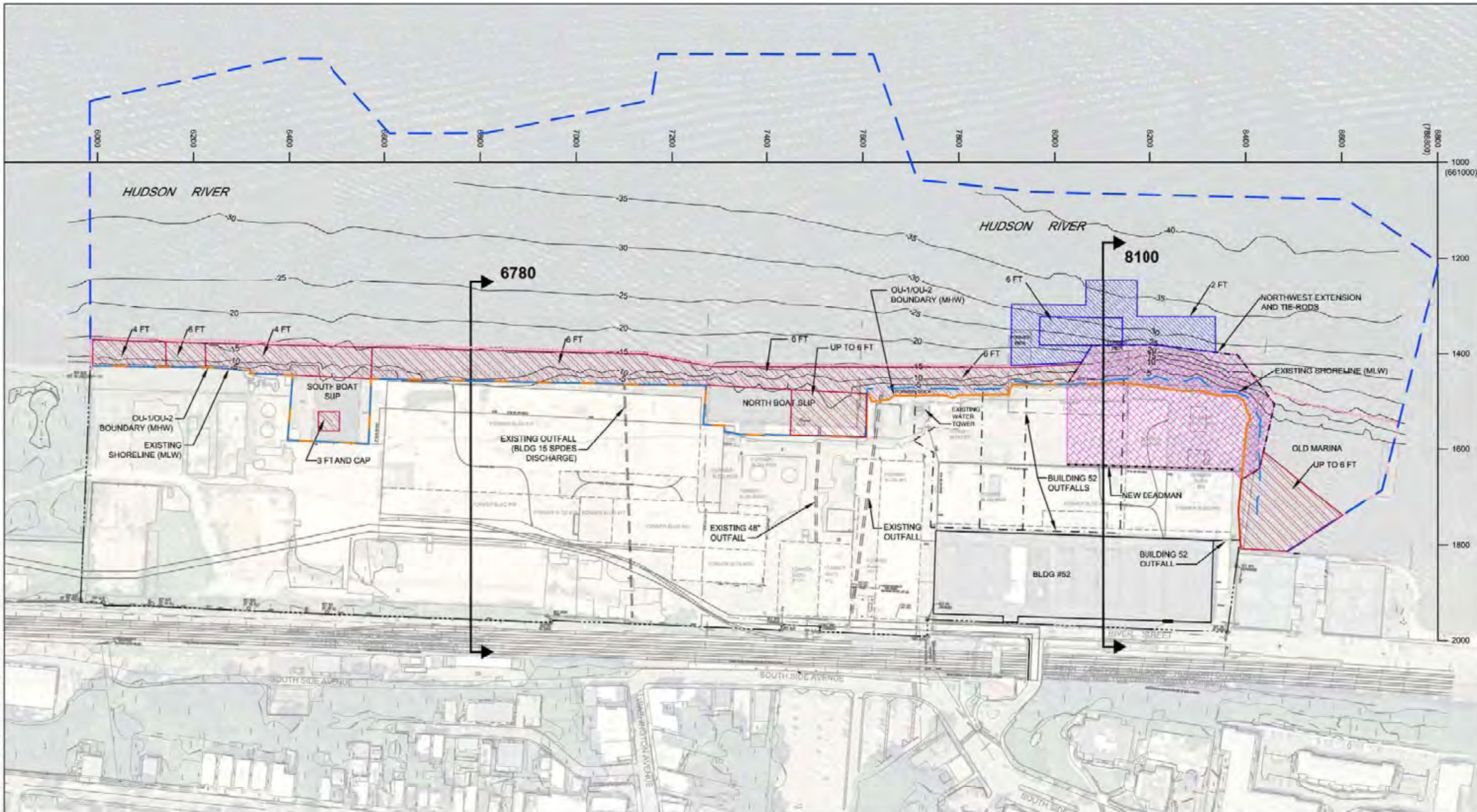


Figure 6

Metals > 95th Percentile Background Conc.
Copper (129 ppm), Lead (132 ppm), Zinc (234 ppm)

Harbor at Hastings
Town of Greenburgh, Westchester County
Site No. 3-60-022



LEGEND:

- PROPERTY LINE
- RAIL ROAD
- FENCE
- RIP-RAP
- EXISTING OFFSITE OUTFALLS
- EXISTING SHORELINE (MLW)
- OU-1/OU-2 BOUNDARY (MHW)
- SILT CURTAIN
- OU-2 SECTION LINES
- NORTHWEST EXTENSION
- NEARSHORE AND BACKWATER DREDGE AREA
- DEEPWATER DREDGE AREA
- BULKHEAD WALL
- OU-2 LIMITS

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. OTHER SITE FEATURES BASED ON VARIOUS HISTORICAL DOCUMENTS.
3. EXISTING 5 FT BATHYMETRY BASED ON DATA FROM ALPINE OCEAN SEISMIC SURVEY (1997).
4. ELEVATION CONTOURS ARE BASED ON NAVD 88 DATUM.
5. BACKGROUND ORTHOIMAGERY FROM NAIP, 2010.
6. DREDGE DEPTHS ARE SHOWN AS MAXIMUM DEPTHS. ACTUAL DREDGE MAY BE CONSTRAINED BY CONSTRUCTIBLE LIMITS, AS SHOWN ON THE SECTIONS.
7. OU-1 REMEDIAL ACTIVITIES ARE SHOWN ON FIGURES 28 AND 30.
8. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS.

N / S / E / W

0 200 400
SCALE IN FEET

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

PLAN VIEW
MODIFIED ALTERNATIVE 6

SCALE: AS SHOWN
FEBRUARY 2012

FIGURE 7

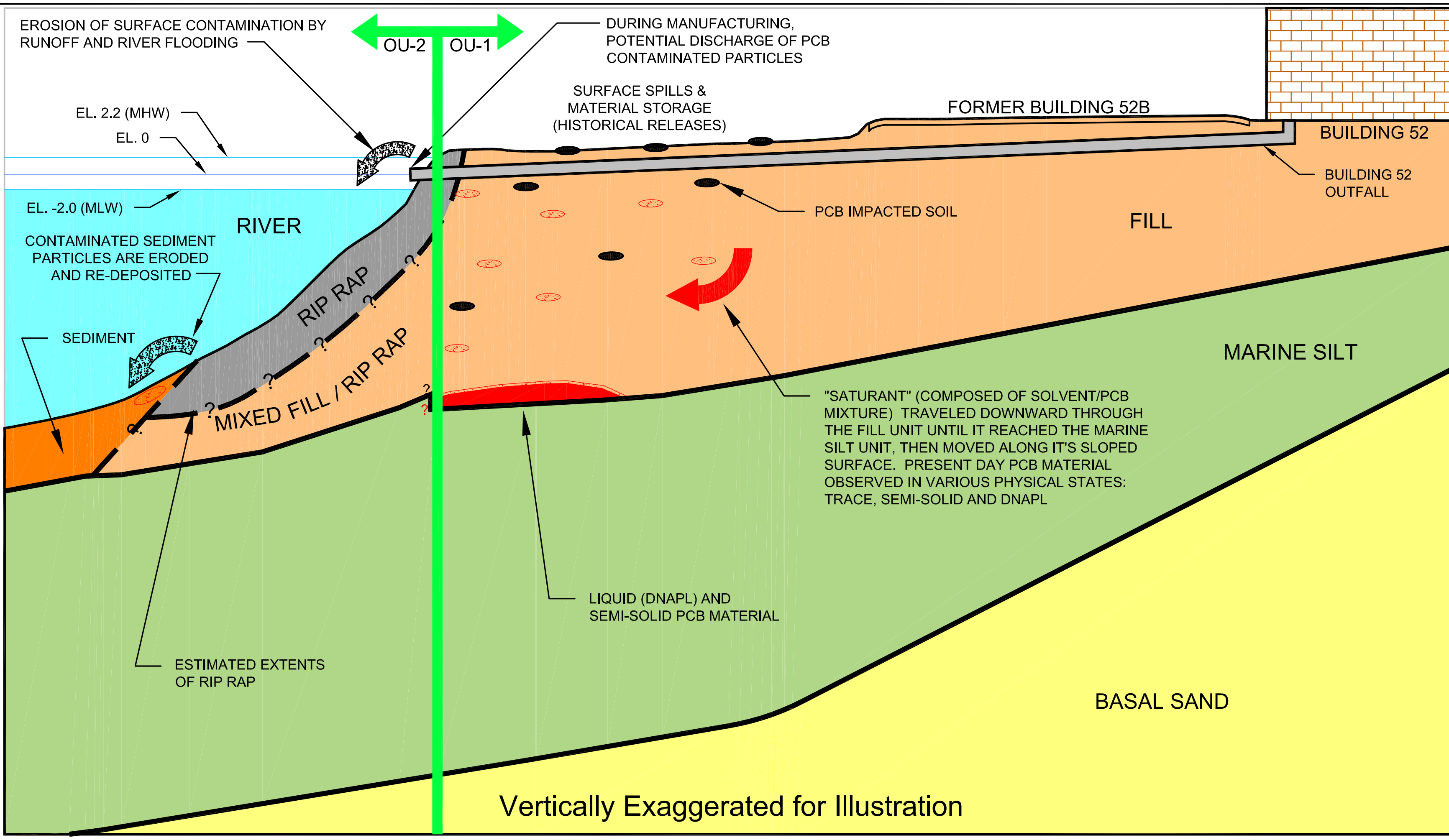
G:\PROJECTS\26512\265 - FINAL RFS\CAD\MODIFIED ALTERNATIVE 6\26512-265-PRAP MODIFIED ALT 6.DWG

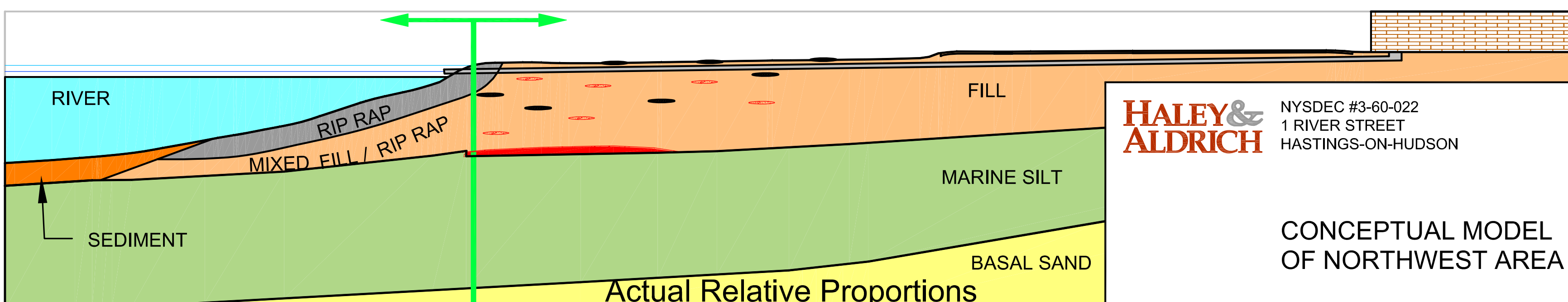
Appendix C Figures from RFS

October 2011, Revised Feasibility Study, Former Anaconda Wire and Cable Company Site, Hastings-on-Hudson, NY, NYSDEC Site # 3-60-022, Haley & Aldrich of New York.

Figure 4.	Conceptual Model of Northwest Area
Figure 5.	DNAPL Extents
Figure 6.	PCB Material Locations
Figure 18.	Alternatives 5, 6, 7, 8: Section 8100
Figure 21.	Alternatives 3, 6: Section 6780
Figure 32.	OU-1 Excavation Plan

G:\PROJECTS\28612\250 - RFS\CAD\PLAN VIEWS & SECTIONS\28612-CSM NW AREA FIG-4_D2.DWG





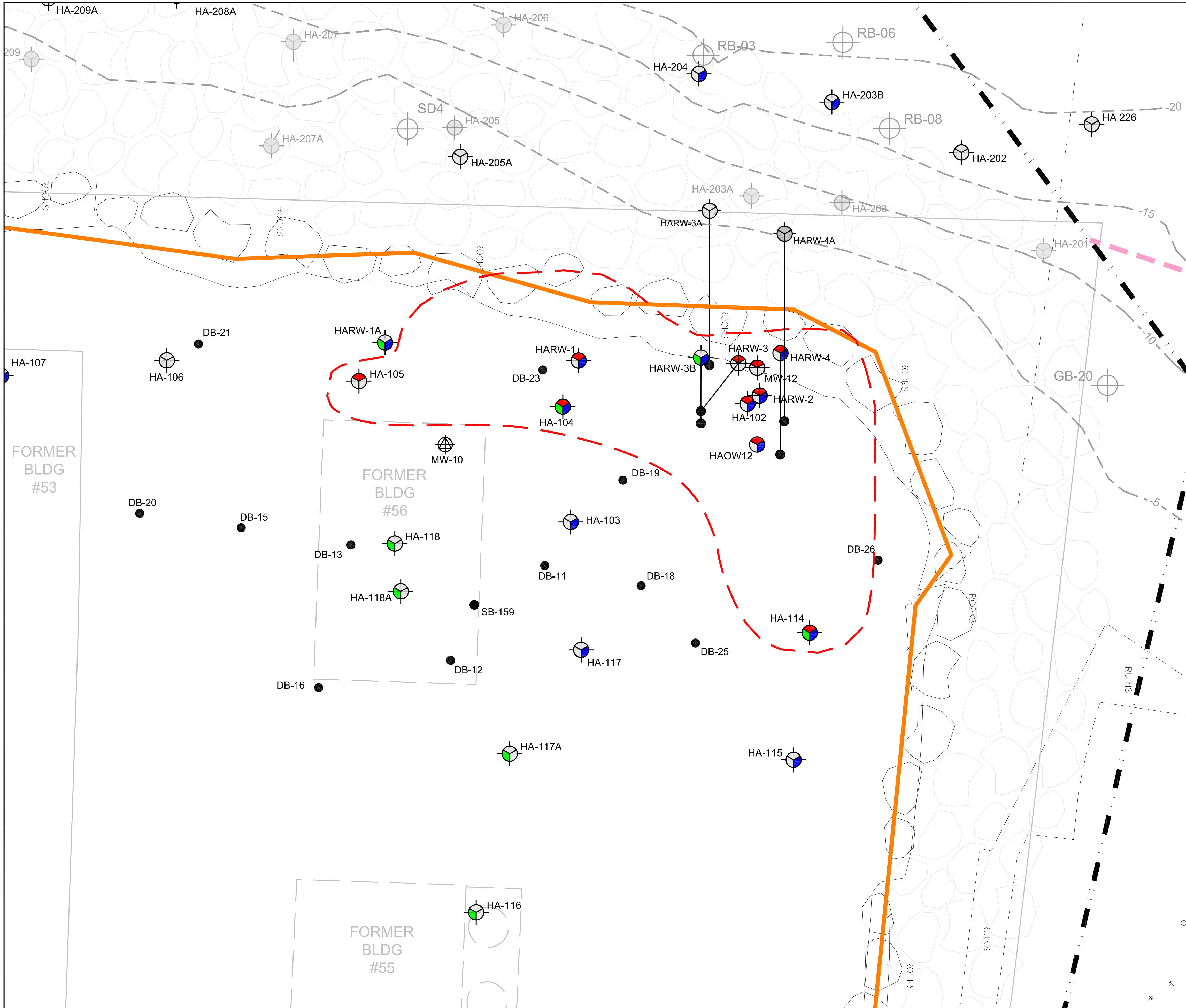
HALEY & ALDRICH

NYSDEC #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON

CONCEPTUAL MODEL OF NORTHWEST AREA

SCALE: NOT TO SCALE
SEPTEMBER 2011

FIGURE 4



LEGEND:

- PROPERTY LINE
- EXISTING STRUCTURES
- DNAPL BARRIER
- SILT CURTAIN
- OU-2/OU-1 BOUNDARY
- APPROXIMATE ASSUMED RECOVERAL DNAPL EXTENTS
- RIP-RAP
- EXPLORATION LOCATION TO MARINE SILT INTERFACE
- EXPLORATION LOCATION WHERE MARINE SILT WAS NOT ENCOUNTERED DUE TO REFUSAL
- HISTORICAL SAMPLE LOCATION (DEPTH VARIES)
- HISTORICAL SAMPLE LOCATION (DEPTH VARIES)
- ANGLED EXPLORATION LOCATION

SAMPLE LEGEND:

LIQUID PCB MATERIAL
SEMISOLID PCB MATERIAL
TRACE PCB MATERIAL

- LIQUID PCB MATERIAL OBSERVED
- SEMISOLID PCB MATERIAL OBSERVED
- TRACE PCB MATERIAL OBSERVED
- NO PCB MATERIAL OBSERVED

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.
5. HA-100 SERIES BORING LOCATIONS ON SHORE SURVEYED BY BOSWELL ENGINEERING IN SEPTEMBER 2007 & APRIL 2008.
6. HA-200 SERIES BORING LOCATIONS OFF SHORE WERE LOCATED USING A GLOBAL POSITIONING SYSTEM.
7. CURRENTLY AVAILABLE DATA COLLECTED DURING DNAPL IRM PILOT TESTS, SUPPLEMENTAL NORTHWEST CORNER INVESTIGATION AND HISTORIC BORINGS.

HALEY & ALDRICH

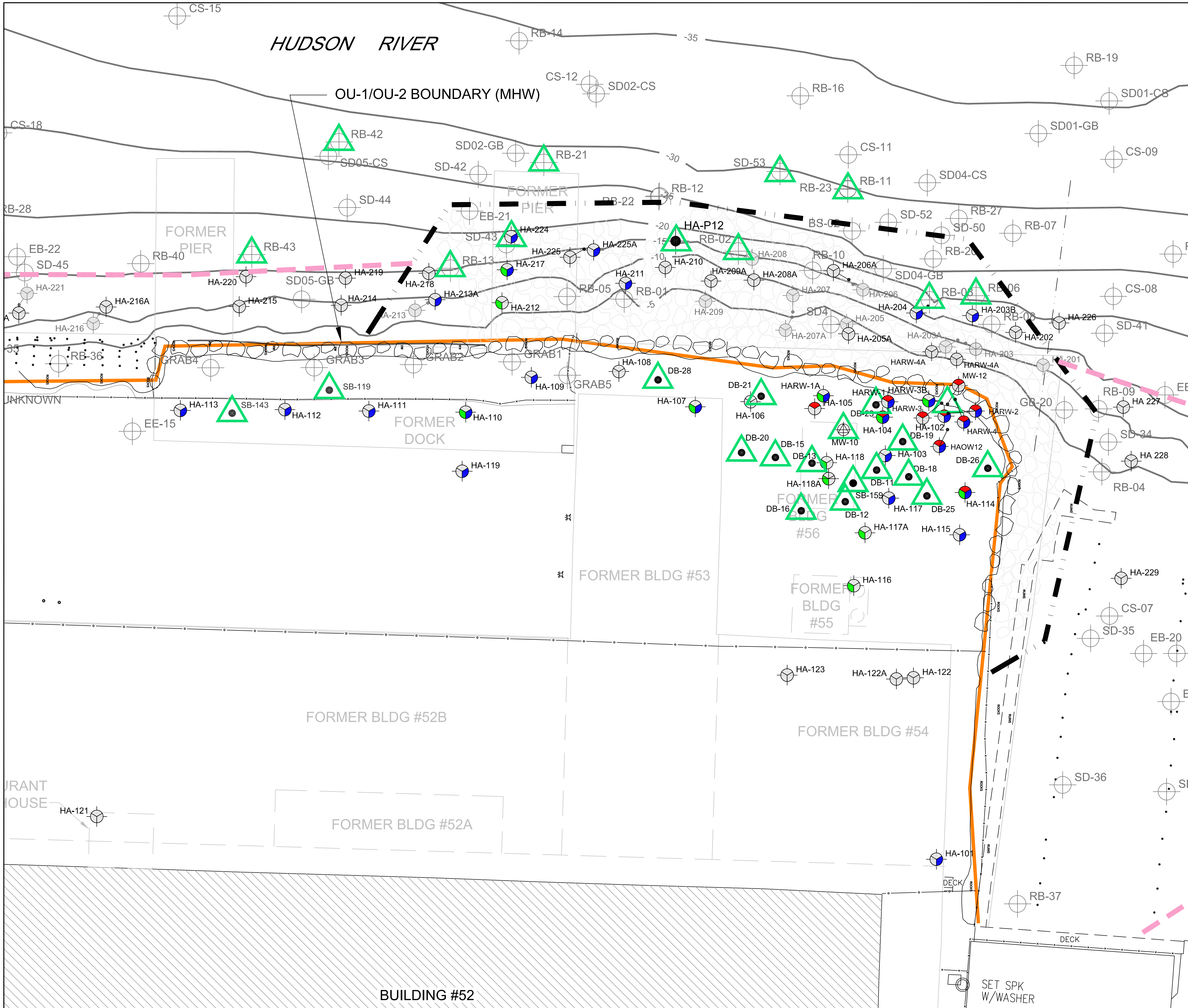
NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

DNAPL EXTENTS

SCALE: AS SHOWN
MAY 2011

FIGURE 5

G:\PROJECTS\28612\250 - RFS\CAD\PLAN VIEWS & SECTIONS\28612-PCB MATERIAL EXTENTS.DWG



LEGEND:

- EXISTING STRUCTURES
- PROPOSED DNAPL BARRIER
- PROPOSED TEMPORARY SILT CURTAIN
- OU-2/OU-1 BOUNDARY (MHW)
- RIP-RAP
- EXPLORATION LOCATION TO MARINE SILT INTERFACE
- LEADER INDICATING ACTUAL EXPLORATION LOCATION
- EXPLORATION LOCATION WHERE MARINE SILT WAS NOT ENCOUNTERED DUE TO REFUSAL
- HISTORICAL SAMPLE LOCATION (DEPTH VARIES)
- HISTORICAL SAMPLE LOCATION (DEPTH VARIES)
- RIP-RAP INVESTIGATION PROBE

SAMPLE LEGEND:

LIQUID PCB MATERIAL

SEMISOLID PCB MATERIAL

TRACE PCB MATERIAL

- LIQUID PCB MATERIAL OBSERVED
- SEMISOLID PCB MATERIAL OBSERVED
- TRACE PCB MATERIAL OBSERVED
- NO PCB MATERIAL OBSERVED
- INFERRED PCB MATERIAL LOCATION

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.
5. HA-100 SERIES BORING LOCATIONS ON SHORE SURVEYED BY BOSWELL ENGINEERING IN SEPTEMBER 2007 & APRIL 2008.
6. HA-200 SERIES BORING LOCATIONS OFF SHORE WERE LOCATED USING A GLOBAL POSITIONING SYSTEM.
7. CURRENTLY AVAILABLE DATA COLLECTED DURING DNAPL IRM PILOT TESTS, SUPPLEMENTAL NORTHWEST CORNER INVESTIGATION AND HISTORIC BORINGS.

HALEY & ALDRICH

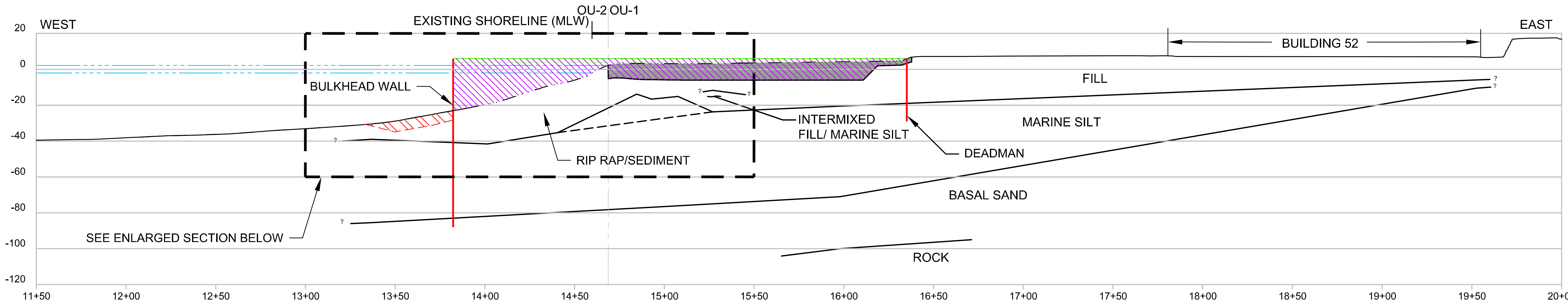
NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

PCB MATERIAL LOCATIONS

SCALE: AS SHOWN
MAY 2011

FIGURE 6

G:\PROJECTS\28612\250 - RFS\CAD\PLAN VIEWS & SECTIONS\28612-PCB MATERIAL EXTENTS.DWG

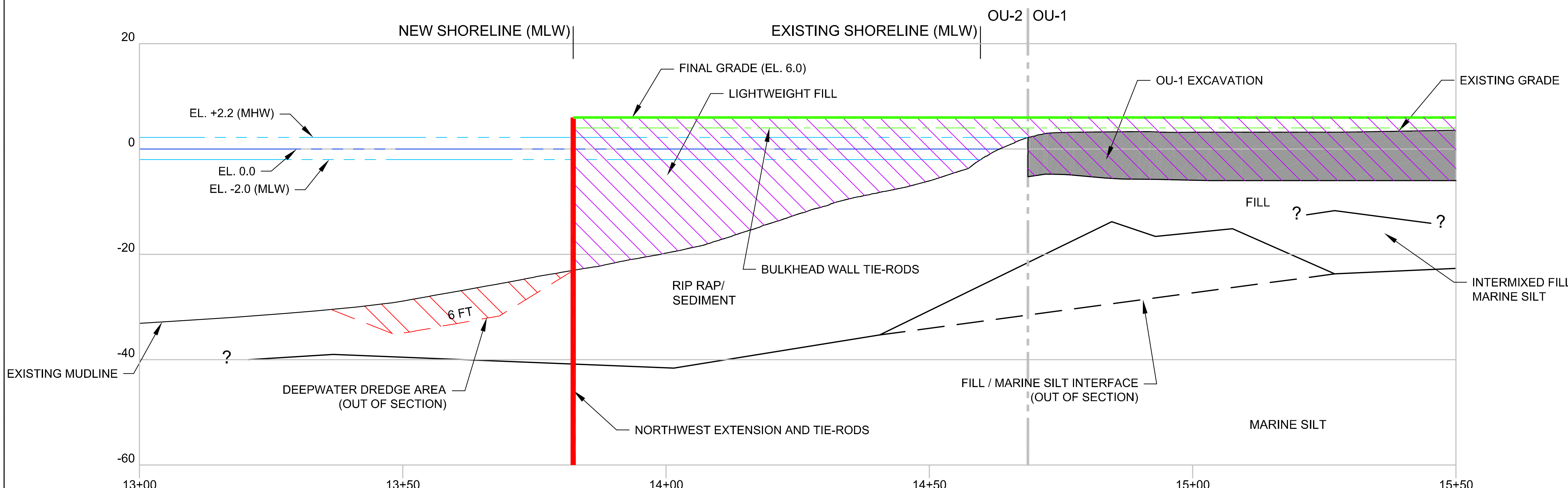


HORIZ. 0 60 120

VERT. 0 60 120

SCALE IN FEET

SECTION 8100 - FULL SECTION



HORIZ. 0 20 40

VERT. 0 20 40

SCALE IN FEET

SECTION 8100 - NORTHWEST EXTENSION

SEE FIGURE 16 FOR LEGEND AND NOTES

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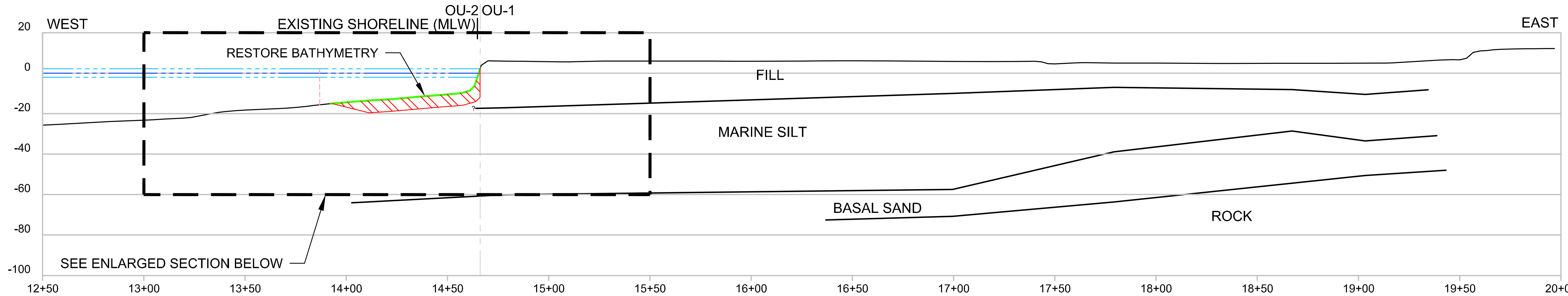
HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

ALTERNATIVES 5, 6, 7, 8
SECTION 8100

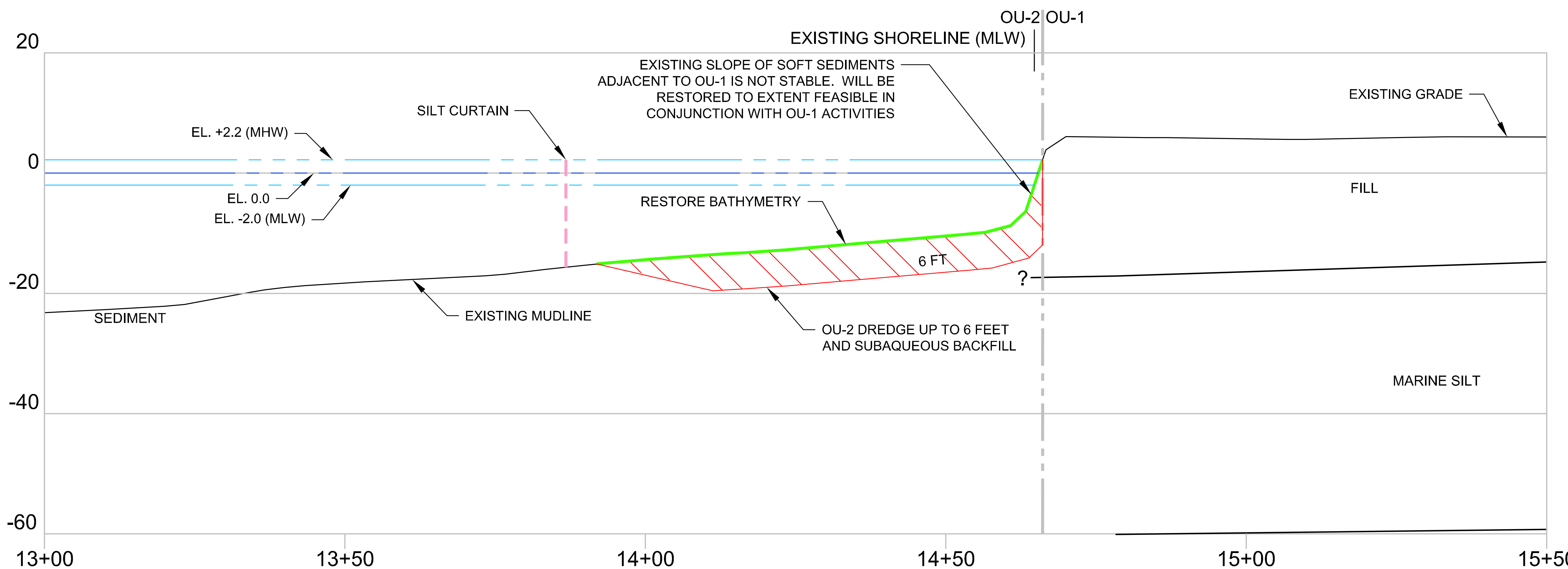
SCALE: AS SHOWN
MAY 2011

FIGURE 18



HORIZ. 0 60 120
VERT. 0 60 120
SCALE IN FEET

SECTION 6780 - FULL SECTION



HORIZ. 0 20 40
VERT. 0 20 40
SCALE IN FEET

SECTION 6780 - NEARSHORE DREDGE (6 FT) AND BACKFILL

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

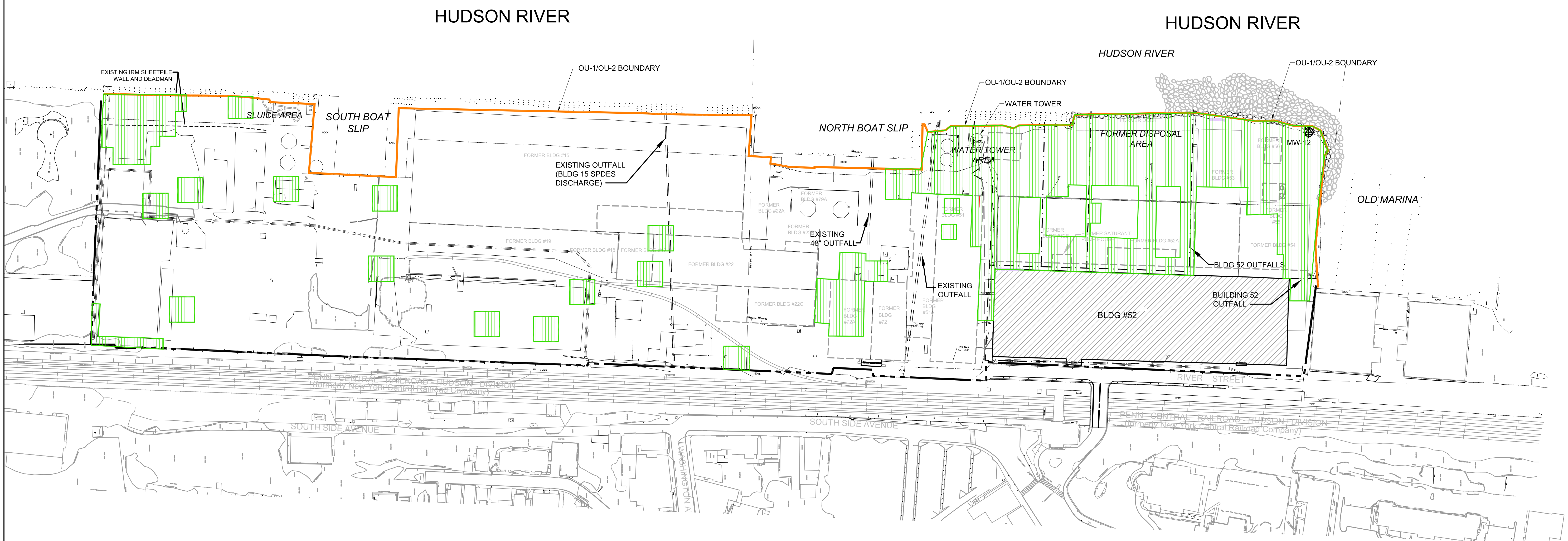
ALTERNATIVES 3, 6
SECTION 6780

SCALE: AS SHOWN
MAY 2011

FIGURE 21

SEE FIGURE 16 FOR LEGEND AND NOTES

G:\PROJECTS\28612\250 - RFS\CAD\PLAN VIEWS & SECTIONS\28612-250-RFS SECTIONS-ALTERNATIVES_D7.DWG



LEGEND:
- PROPERTY LINE
- RAIL ROAD
- EXISTING STRUCTURES
- RIP-RAP
- OU-1/OU-2 BOUNDARY
- BUILDING 52 OUTFALLS
- EXISTING OFFSITE OUTFALLS
- MONITORING WELL
- OU-1 EXCAVATION AREA (DEPTH VARIES)

NOTES:
1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. OTHER SITE FEATURES BASED ON VARIOUS HISTORICAL DOCUMENTS.
3. NUMEROUS MONITORING WELLS ARE LOCATED ON SITE. HOWEVER, ONLY MW-12 IS SHOWN AS IT IS THE FIRST LOCATION WHERE LIQUID PCB MATERIAL WAS OBSERVED.
4. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS.
5. OU-1/OU-2 BOUNDARY IS MHW.
6. APPROXIMATE EXCAVATION AREAS BASED ON CURRENT DATA. AREAS MAY VARY DURING REMEDIAL DESIGN. EXCAVATION DEPTHS UP TO 9 FT BGS.

W
S N
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0 200 400
SCALE IN FEET

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

OU-1 EXCAVATION PLAN

SCALE: AS SHOWN
OCTOBER 2011

FIGURE 32

G:\PROJECTS\28612\250 - RFS\CAD\PLAN VIEWS & SECTIONS\28612-250-RFS OU-1 EXCAVATION_D1.DWG

Appendix C Updated Hudson River Bathymetry Map

LEGEND

- PROPERTY LINE
- RAIL ROAD
- EXISTING STRUCTURES
- EXTENT OF HYDROGRAPHIC SURVEY
- -25 BATHYMETRIC CONTOUR

NOTES

1. PROPERTY BOUNDARY INFORMATION PROVIDED BY WENDEL COMPANIES, DRAWING XVE-HUDSON-TOPO.DWG, PROJECT NO. 438504, DATED SEPTEMBER 21, 2012.
2. GRID SYSTEM IS THE NEW YORK STATE PLANE COORDINATE SYSTEM, EAST ZONE, NAD 83, U.S. SURVEY FEET.
3. SHORELINE AND ONSHORE FEATURES ARE APPROXIMATE AND ARE BASED ON DIGITAL ORTHOPHOTO QUADRANGLES FLOWN IN 2009 AND OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE (NYGIS).
4. THE CONTOUR INFORMATION PRESENTED ON THIS DRAWING REPRESENTS THE RESULTS OF A SURVEY PERFORMED BY OCEAN SURVEYS, INC. ON 10-16 DECEMBER 2012 AND CAN ONLY BE CONSIDERED AS INDICATING THE CONDITIONS EXISTING AT THAT TIME.

0 80 160
SCALE IN FEET

HALEY & ALDRICH

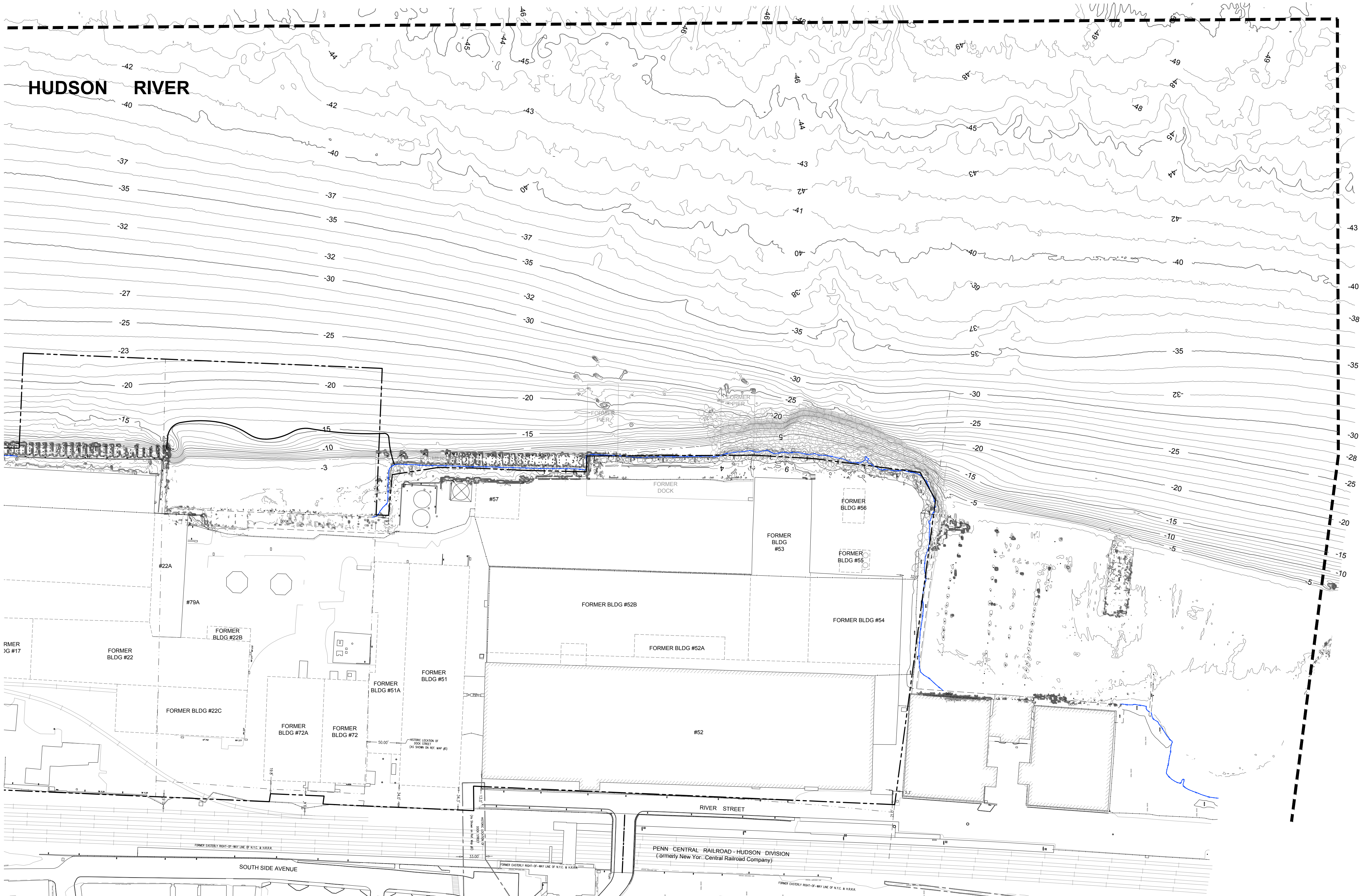
HYDROGRAPHIC SURVEY
NYSDEC SITE #3-60-022
HASTINGS-ON-HUDSON, NEW YORK

BATHYMETRIC CONTOUR PLAN
(SHEET 1 OF 2)

SCALE: AS SHOWN
MARCH 2013

FIGURE 1A

Plot Date: March 14, 2013
Drawing Name: G:\28612_HASTINGS\286\CAD\28612-286_002.DWG
Drawing Layout: SITE PLAN (1)
Operator Name: LUCIDO, SAM

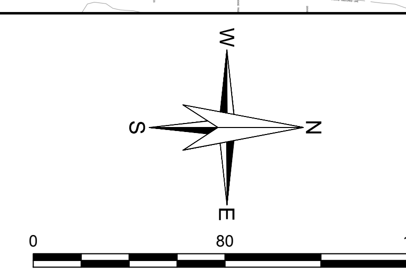


LEGEND

- PROPERTY LINE
- RAIL ROAD
- EXISTING STRUCTURES
- EXTENT OF HYDROGRAPHIC SURVEY
- -25 BATHYMETRIC CONTOUR

NOTES

1. PROPERTY BOUNDARY INFORMATION PROVIDED BY WENDEL COMPANIES, DRAWING XVE-HUDSON-TOPO.DWG, PROJECT NO. 438504, DATED SEPTEMBER 21, 2012.
2. GRID SYSTEM IS THE NEW YORK STATE PLANE COORDINATE SYSTEM, EAST ZONE, NAD 83, U.S. SURVEY FEET.
3. SHORELINE AND ONSHORE FEATURES ARE APPROXIMATE AND ARE BASED ON DIGITAL ORTHOPHOTO QUADRANGLES FLOWN IN 2009 AND OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE (NYGIS).
4. THE CONTOUR INFORMATION PRESENTED ON THIS DRAWING REPRESENTS THE RESULTS OF A SURVEY PERFORMED BY OCEAN SURVEYS, INC. ON 10-16 DECEMBER 2012 AND CAN ONLY BE CONSIDERED AS INDICATING THE CONDITIONS EXISTING AT THAT TIME.



HALEY & ALDRICH

HYDROGRAPHIC SURVEY
NYSDEC SITE #3-60-022
HASTINGS-ON-HUDSON, NEW YORK

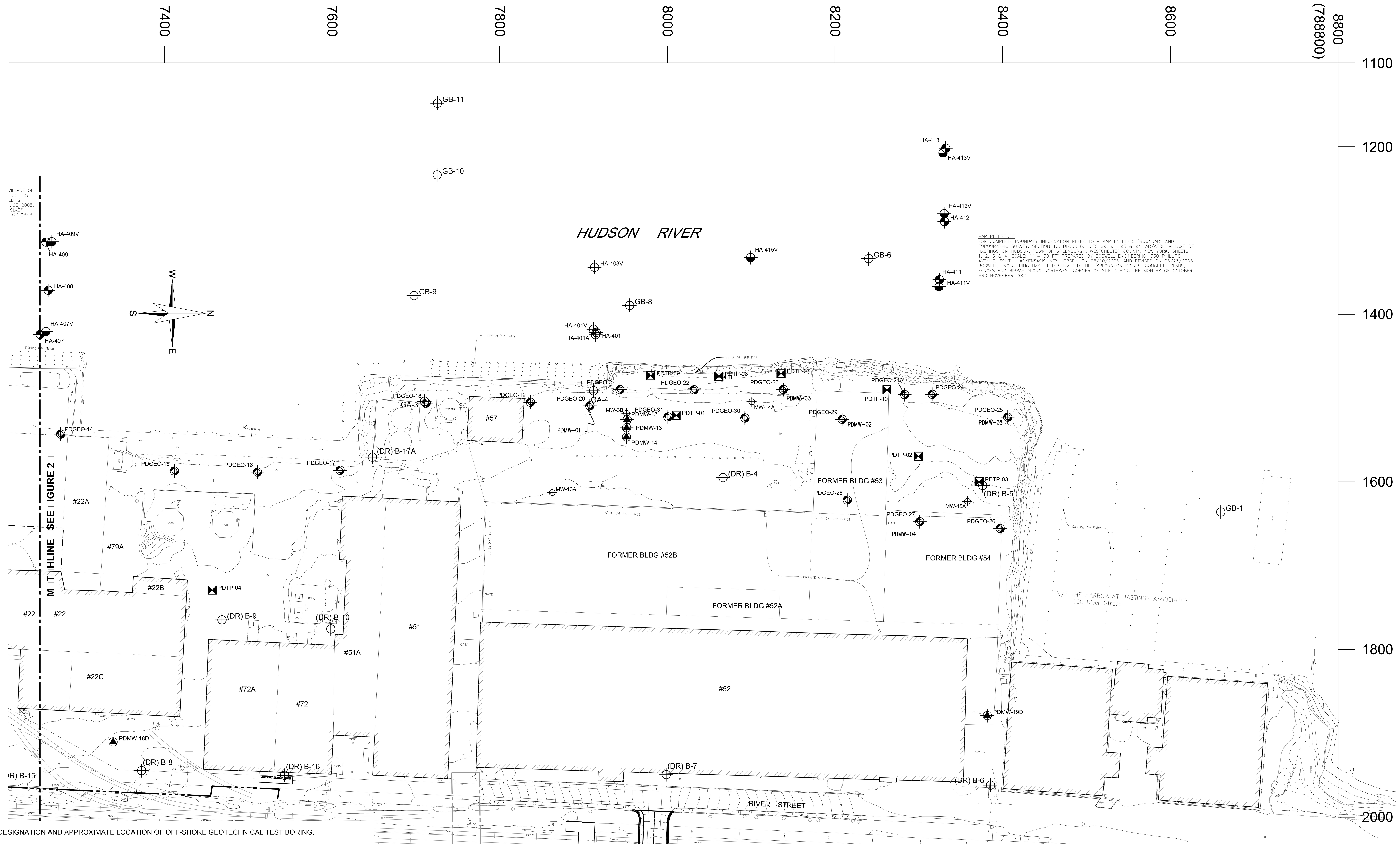
BATHYMETRIC CONTOUR PLAN (SHEET 2 OF 2)

SCALE: AS SHOWN
MARCH 2013

FIGURE 1B

Drawing Name: G:\28612_HASTINGS\286\CAD\28612-286_002.DWG
Operator Name: LUCIDO, SAM
Drawing Layout: SITE PLAN (2)
Plot Date: March 14, 2013

Appendix C Existing Geotechnical Explorations



LEGEND:

HA-411 — DESIGNATION AND APPROXIMATE LOCATION OF OFF-SHORE GEOTECHNICAL TEST BORING.

HA-411V — DESIGNATION AND APPROXIMATE LOCATION OF FIELD VANE TEST.

HA-501A — DESIGNATION AND APPROXIMATE LOCATION OF ON-SHORE GEOTECHNICAL TEST BORING FOR CROSSHOLE SEISMIC TEST.

PDGEO-25 — DESIGNATION AND APPROXIMATE LOCATION OF GEOTECHNICAL BORING DRILLED DURING PRE-DESIGN INVESTIGATION.

PDMW-14 — DESIGNATION AND APPROXIMATE LOCATION OF MONITORING WELL INSTALLED DURING PRE-DESIGN INVESTIGATION.

PDTP-03 — DESIGNATION AND APPROXIMATE LOCATION OF GEOTECHNICAL TEST PIT EXCAVATED DURING PRE-DESIGN INVESTIGATION.

(DR) B-4 — DESIGNATION AND APPROXIMATE LOCATION OF HISTORICAL BORING DRILLED PRIOR TO PRE-DESIGN INVESTIGATION. THE (DR) DESIGNATION WAS ADDED TO LABELS FOR BORINGS DRILLED BY DOLPH ROTFELD, TO DISTINGUISH THEM FROM OTHER B-SERIES BORINGS AT THE SITE.

NOTES:

1. TECHNICAL MONITORING OF HA-SERIES BORINGS WAS PERFORMED BY HALEY & ALDRICH
2. AS-DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS FOR THE HA-SERIES ON-SHORE BORINGS WERE DETERMINED IN THE FIELD BY SURVEY. AS-DRILLED LOCATIONS OF THE HA-SERIES OFF-SHORE BORINGS WERE DETERMINED BY GPS, AND MUDLINE ELEVATIONS WERE DETERMINED USING TIDE BOARDS INSTALLED ALONG THE SHORELINE.

DRAFT

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SCALE IN FEET

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

PLAN SHOWING EXISITNG GEOTECHNICAL EXPLORATIONS

SCALE: AS SHOWN
FEBRUARY 2014

FIGURE 2B

28612-116 D093 (D092)
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LEGEND:

HA-411	DESIGNATION AND APPROXIMATE LOCATION OF OFF-SHORE GEOTECHNICAL TEST BORING.
HA-411V	DESIGNATION AND APPROXIMATE LOCATION OF FIELD VANE TEST.
HA-501A	DESIGNATION AND APPROXIMATE LOCATION OF ON-SHORE GEOTECHNICAL TEST BORING FOR CROSSHOLE SEISMIC TEST.
PDGEO-25	DESIGNATION AND APPROXIMATE LOCATION OF GEOTECHNICAL BORING DRILLED DURING PRE-DESIGN INVESTIGATION.
PDMW-14	DESIGNATION AND APPROXIMATE LOCATION OF MONITORING WELL INSTALLED DURING PRE-DESIGN INVESTIGATION.
PDTP-03	DESIGNATION AND APPROXIMATE LOCATION OF GEOTECHNICAL TEST PIT EXCAVATED DURING PRE-DESIGN INVESTIGATION.
(DR) B-4	DESIGNATION AND APPROXIMATE LOCATION OF HISTORICAL BORING DRILLED PRIOR TO PRE-DESIGN INVESTIGATION. THE (DR) DESIGNATION WAS ADDED TO LABELS FOR BORINGS DRILLED BY DOLPH ROTFELD, TO DISTINGUISH THEM FROM OTHER B-SERIES BORINGS AT THE SITE.

NOTES:

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DR T

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SCALE IN FEET

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

PLAN SHOWING EXISTING GEOTECHNICAL EXPLORATIONS

SCALE: AS SHOWN
FEBRUARY 2014

FIGURE 2A

G:\28612\231 - GEOTECH DATA REPORT\CAD\28612-319-D098-SITEGEO PRESENTATION.DWG

APPENDIX 1

Phase 1 PDI Investigation Plan

Haley & Aldrich of New York
200 Town Centre Drive
Suite 2
Rochester, NY 14623

Tel: 585.359.9000
Fax: 585.359.4650
HaleyAldrich.com

HALEY& ALDRICH

MEMORANDUM

7 March 2013
File No. 28612-293

TO: Atlantic Richfield
Paul Johnson, P.G.

CC: Haley & Aldrich of New York
Wayne C. Hardison, P.E.

FROM: Haley & Aldrich of New York
Keith M. Aragona, P.E.

SUBJECT: PDI Phase 1 Work Plan Memorandum

This Pre-Design Investigation (PDI) Phase 1 Work Plan (Phase 1 WP) Memorandum describes a portion of the work that will be performed to support the PDI and remedial design. These activities will be completed at the Former Anaconda Wire & Cable Company site (Site), NYSDEC Site # 3-60-022, located on the east shore of the Hudson River at 1 River Street, Hastings-on-Hudson, New York (Figure 1). This Phase 1 WP was prepared on behalf of Atlantic Richfield (AR).

PHASE 1 OVERVIEW

Specific objectives of the Phase 1 work attempt to:

- Locate subsurface features using Ground Penetrating Radar
- Locate site feature and update topographic survey, and
- Install groundwater level data loggers in select monitoring wells.

Collected data will be used to:

- Plan subsequent pre-design data collection efforts,
- Support the design phase of engineering, and
- Support of the groundwater model

SCOPE OF WORK

Activities that will be performed are described below.

A. Ground Penetrating Radar

A ground penetrating radar (GPR) survey of the Site will be completed to the extent practicable. This information will be used as a screening tool in order to identify subsurface features (such as basements, sumps, and large voids) that may require further delineation during PDI activities. GPR results will also be evaluated in an attempt to assess concrete slab thickness, the potential presence of shoreline voids, and other subsurface features and structures.

The effectiveness of GPR at the site will depend upon on the subsurface conditions including slab thickness, quantity of rebar present in concrete slabs, composition of fill material, and brackish water due to the presence of the Hudson River. Therefore, in order to confirm the effectiveness of a GPR survey, the first step in the field program will be to evaluate GPR in several areas prior to finalizing the site wide program. Any areas of the site which are not conducive to GPR will be excluded from the program. Additionally, grid spacing within identified GPR survey areas will vary based on screening results. GPR coverage and appropriate grid spacing will be determined in the field based on screening results.

B. Upland Survey

A better understanding of topography is required in order to complete the final design. To develop the design, the existing topography map of the Site will be updated. Additionally, subsurface features identified by the GPR survey and historical maps will also be located. The survey work will be performed by Wendel Duchscherer, a licensed NYS surveyor, under an agreement with Haley & Aldrich of New York on behalf of ARCO.

C. Groundwater Level Data Logger Installation

Groundwater level data loggers (pressure transducers) will be installed at viable locations (approximately 15 locations) within the existing monitoring well network (as shown in Figure 1). During the PDI, new monitoring wells may be installed in order to further evaluate current hydrogeologic conditions in order to support updating the groundwater model. If new wells are required, installation will be described in a subsequent work plan. Data logger deployment locations were chosen to monitor hydraulic gradient and tidal influence in the Fill and Basal Sand hydrostratigraphic units as shown on Figure 1.

Prior to installation of the data loggers, the wells will be located and evaluated to determine usability. If a well is not suitable for use, an alternate location may be chosen during subsequent phases of work. Data will be downloaded from the data loggers at least every two months for a minimum of six months.

Pressure transducers will be capable of recording approximately 40,000 data points. Data recording frequency will be determined during the groundwater model planning process. Groundwater levels will be measured manually at each location immediately following deployment of the transducer and during each download event. Barometric pressure will be monitored at one location on Site in order to make the proper correction to groundwater level data.

QUALITY ASSURANCE PROCEDURES

All data will be collected with sufficient quality in order to be relied upon to support the remedial design.

A. Ground Penetrating Radar

Noggin SmartCart 1,000, 500, and 250 MHz GPR units or equivalent will be utilized to conduct the GPR survey. Multiple frequency devices will be used in order to maximize the investigation depth and resolution. The penetration depth increases and resolution decreases with decreasing frequency and vice versa.

B. Survey Control

Survey grade global positioning system (GPS) along with conventional survey methods will be used in the vicinity of the project area. The following project control information as will be used for field data collection and mapping.

<u>Horizontal Datum:</u> North American Datum of 1983 (NAD83), New York State Plane, eastern zone coordinate system, U.S. Survey Foot using the existing site control:

PID: KU1618
NAD 83(1996): Lat. 40° 56’ 27.40174”
Long. 73° 57’ 26.68224”
S.P.C. NY E: 768,147.13 ft.
642,016.48 ft.

<u>Vertical Datum:</u> North American Vertical Datum of 1988 (NAVD88), U.S. Survey Foot using the existing site control:

PID: KU1793
ELEV. (NAVD88): 65.77 ft.

C. Groundwater Level Data Logger Installation

Groundwater levels will be measured on a continuous basis at each monitoring location using In Situ Inc. Rugged Troll 200 pressure transducers or equivalent. Transducers employed at the Site are factory-calibrated within the past year and will be confirmed in the field for proper function prior to deployment. Downloaded raw data will be archived prior to manipulation and then exported to a spreadsheet. Corrections for variations in barometric pressure will be performed using data collected from the onsite barologger. Reference point groundwater elevations will be manually measured at each monitoring well location following activation of the transducers and during each data download in order to confirm monitor pressure transducer readings. Pressure data will be converted to groundwater level data if required based on field verification and measurements) and then to groundwater elevations (if required) for use in the groundwater model.

HEALTH & SAFETY

Health and safety requirements applicable to all persons entering the site or involved in field activities are described in the Site-specific Health Safety Security and Environmental Plan (HSSEP), these documents will be available for use on Site prior to the commencement of work.

SCHEDULE

This work is planned to begin in April and is anticipated to be 2 to 3 weeks in duration.

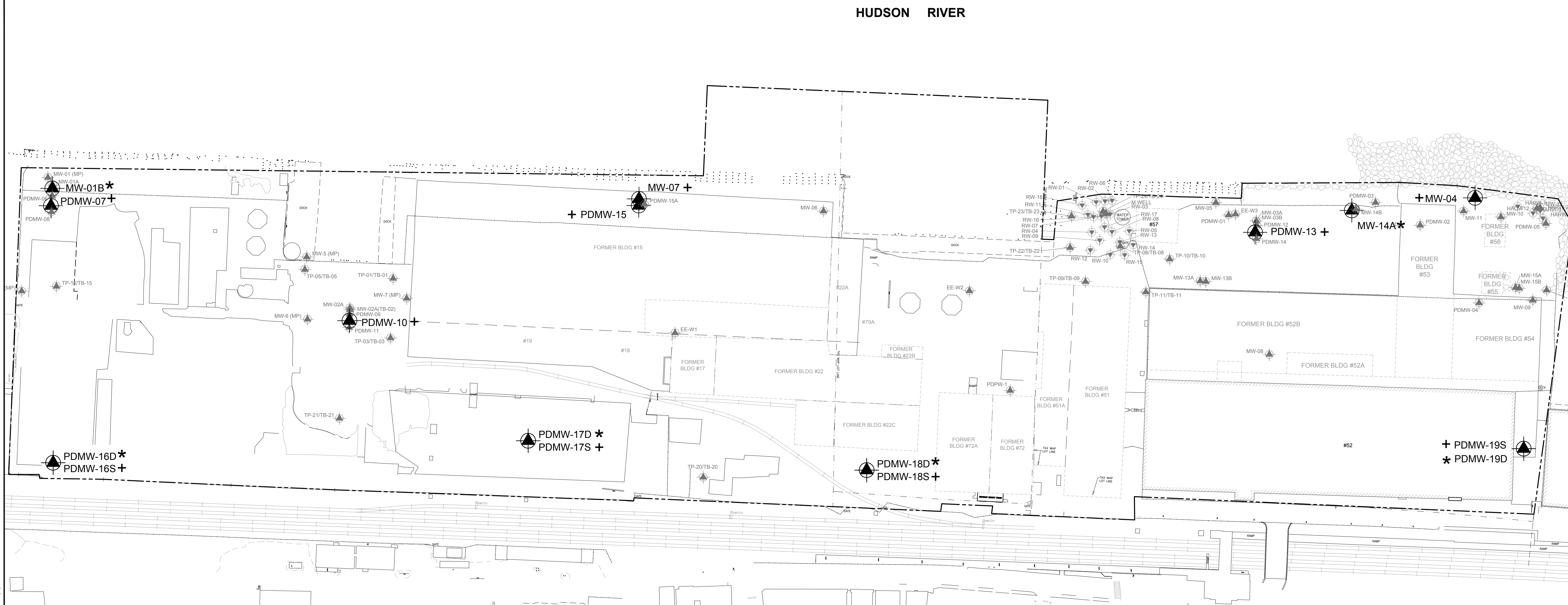
DELIVERABLES

Results of the GPR survey indicating suspected subsurface features and utilities and an updated topographic map of the site will be provided to the NYSDEC upon completion of validation, review, and interpretation of the data. Other data will be incorporated in to the remedial design as applicable.

FIGURES

Figure 1 – Pressure Transducer Installation Program

FIGURES



LEGEND

- PROPERTY LINE
- RAIL ROAD
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RETAINING WALL
- MONITORING WELL
- RECOVERY WELL
- MONITORING WELL (PART OF DATA LOGGER INSTALLATION PLAN)
- + WELL SCREEN LOCATED IN FILL UNIT
- * WELL SCREEN LOCATED IN BASAL SAND UNIT

NOTES

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. PROPERTY BOUNDARY INFORMATION PROVIDED BY WENDEL COMPANIES, DRAWING XVE-HUDSON-TOPO.DWG, PROJECT NO. 438504, DATED SEPTEMBER 21, 2012.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.

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SCALE IN FEET

HALEY & ALDRICH

IRM DNAPL EXTRACTION SYSTEM EXPANSION
NYSDEC SITE #3-60-022
HASTINGS-ON-HUDSON, NEW YORK

DATA LOGGER INSTALLATION PLAN

SCALE: AS SHOWN
MARCH 2013

FIGURE 1

Drawing Name: G:\28612_HASTINGS\293\CAD\28612-293-002.DWG
Operator Name: LUCIDO, SAM
Drawing Layout: DATA LOGGER PLAN (1)
Plot Date: March 7, 2013

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau C, 11th Floor
625 Broadway, Albany, New York 12233-7014
Phone: (518) 402-9662 • **Fax:** (518) 402-9679
Website: www.dec.ny.gov

Joe Martens
Commissioner

April 1, 2013

Mr. Paul G. Johnson, PG
Operations Project Manager
Atlantic Richfield Company
Remediation Management
150 W. Warrenville Road
MC 200 1E
Naperville, Illinois 60563

Dear Mr. Johnson:

Re: Harbor at Hastings Site 360022
Pre-Design Investigation Phase 1 Work Plan

The New York State Department of Environmental Conservation (Department) has reviewed the Pre-Design Investigation Phase 1 Work Plan dated March 7, 2013. The work involves locating subsurface features using Ground Penetrating Radar, updating the topographic survey, and installing groundwater data loggers to monitor groundwater levels. The Work Plan is approved with the following modifications listed below.

1. Submit a proposed grid for the ground penetrating radar before the proposed start date.

2. The installation of the groundwater data loggers should include an additional location in the area of the water tower. This location would monitor the groundwater level within the fill unit.

Pursuant to the existing Order on Consent for the project, please notify the NYSDEC at least seven calendar days in advance of any work to be conducted under the work plan.

Please contact me if you have any questions or concerns at (518) 402-9662.

Sincerely,

William T. Ports

William T. Ports, P.E.
Project Manager
Remedial Bureau C

ec: J. Nealon DOH
F. Navatril DOH
N. Walz DOH
C. Gosier DEC
R. Quail DEC

Haley & Aldrich of New York
200 Town Centre Drive
Suite 2
Rochester, NY 14623

Tel: 585.359.9000
Fax: 585.359.4650
HaleyAldrich.com

MEMORANDUM

12 April 2013
File No. 28612-293

TO: Atlantic Richfield
Paul Johnson, P.G.

C: Haley & Aldrich of New York
Wayne C. Hardison, P.E.

FROM: Haley & Aldrich of New York
Keith M. Aragona, P.E.

SUBJECT: Hastings on Hudson PDI Phase 1 Work Plan Memorandum

As requested in the NYSDEC letter dated 1 April 2013 approving the Pre-Design Investigation Phase 1 Work Plan, attached are the following:

1. Table 1 and Figure 2R describing the ground penetrating radar (GPR) work scope. The proposed GPR work will entail evaluating specific areas of the site which require additional information to adequately complete the remedial design. Historical drawings are currently being reviewed in order to identify additional subsurface features that may require additional investigation.

2. Figure 1R showing the revised pressure transducer installation program including an additional data logger installed in RW-3 in the Water Tower area. As indicated in the Phase 1 Work Plan, each monitoring well in the data logger installation plan will be located and inspected to determine suitability prior to installation. If monitoring wells are not suitable for data logger installation, an alternate location will be proposed.

Attachments
Table 1 – GPR Survey Scope
Figure 1R – Revised Pressure Transducer Installation Program
Figure 2R – GPR Survey

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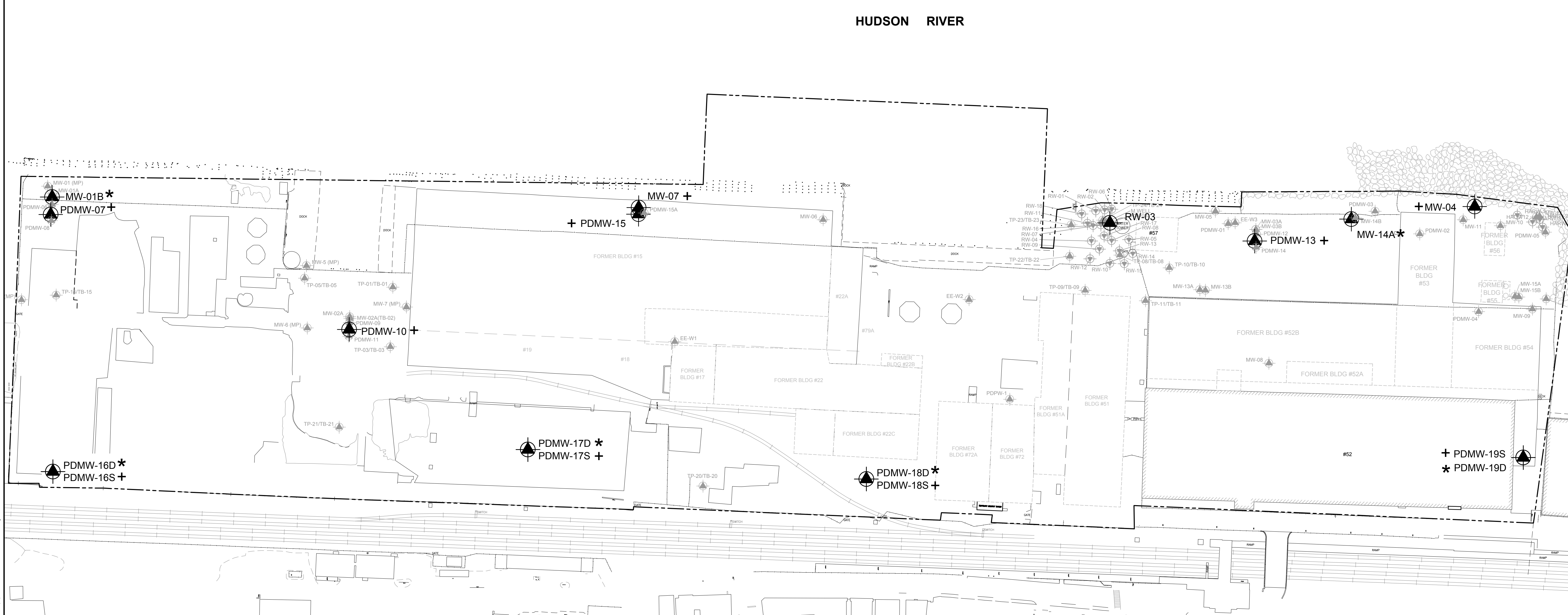
TABLE 1
GPR SURVEY WORK SCOPE
ATLANTIC RICHFIELD
1 River Street
Hastings-on-Hudson, NY

Location on Figure 2R	AREA	Primary Objective (see notes below)	GPR Confirmation Test Locations	Approx. Length (ft)	Primary Objective (see notes below)	Full Scale Scope (if required)	Approx. Length (ft)
1	Building 15	V	* Complete 3 transects east-west; located where voids are known to extend inland	500	V, T	* Complete 25 transects east-west on 25 ft on center from the north side of the south boat split to the south side of the north boat slip; * Complete 2 transects north-south from the north side of the south boat split to the south side of the north boat slip.	6,900
2	Building 51 area	V, T	Complete 2, 140 foot long transects east-west from the shoreline in tank area inland	300	C, V	NONE	0
3	North Boat Slip Shoreline	V, T	* Complete 34, 80 +/- ft long east-west transects on 10 foot centers from west end of boat slip to the east * Complete 2 transects north-south from the south side of the north boat split to the north side of the north boat slip.	3,600	V, T	NONE	0
4	South Boat Slip Shoreline	V, T	Complete 37 transects transects north-south and east west (see Figure 2) 10 ft on center from west end of boat slip toward the east	2,800		NONE	0
5	Old Marina Shoreline		NONE	0	V, C	Complete 2 transects east-west from the east end of the northwest corner to the eastern property boundary.	900
6	Shore Area West of Building 52	C	Complete 1 transect north-south from the north end of the northwest corner to south of the water tower	700	C	Complete 2 transects north-south 80 foot on center from the north end of the northwest corner to south of the water tower	1,400
7	Building 52B Area	T, C	Complete 1 transect north-south from the north end of former Building 52B to the south.	600	T, C, V	Complete approximately 116 transects east-west 5 feet on center from the north end of former Building 52B to the south	16,000
8	Balance of Site		NONE	0	T, C, V	Complete 11 north-south transects 40 ft on center extending from the southern property boundary to the south end of Building 52.	15,300
9	Subsurface features at where high concentrations observed		NONE	0	C	Complete 22 transects north-south 5 ft on center	300
10 thru 14, 20	Subsurface features at 7 specific locations where high concentrations observed		NONE	0	C, V	Complete approximately 78 transects 2.5 ft on center within approximate 1,000 sf areas established in the field, see Fig. 2	2,340
15	South 48 inch outfall	C	Complete 9 transects north-south 2.5 feet on center at 3 locations in areas that the locations of the pipe is known	90	C	Complete 30 transects north-south 2.5 feet on center at 10 locations along the suspected pipe alignment. Focus effort at east end because the alignment there is unknown, particularly with respect to location this pipe crossed the railroad and enters the site.	300
16	North 18-inch outfall		NONE	0	C	Complete 30 transects north-south 2.5 feet on center at 10 locations along the suspected pipe alignment.	300
17	18-inch outfall		NONE	0	C	Complete 30 transects north-south 2.5 feet on center at 10 locations along the suspected pipe alignment.	300
18	IRM Wall Area		NONE	0	C	Complete 1 transect north-south from the north end of the IRM wall to the southern property boundary	400
19	Known vault	V, C	Complete 13 transects east-west 2.5 feet on center in area of known vault	400		NONE	0
			TOTAL	8,990			44,440

Notes: V =voids
T=thickness of concrete slabs
C=location of underground conduits (pipes)



LEGEND

- PROPERTY LINE
- RAIL ROAD
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RETAINING WALL
- MONITORING WELL
- RECOVERY WELL
- MONITORING WELL (PART OF DATA LOGGER INSTALLATION PLAN)
- \+ WELL SCREEN LOCATED IN FILL UNIT
- * WELL SCREEN LOCATED IN BASAL SAND UNIT

NOTES

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. PROPERTY BOUNDARY INFORMATION PROVIDED BY WENDEL COMPANIES, DRAWING XVE-HUDSON-TOPO.DWG, PROJECT NO. 438504, DATED SEPTEMBER 21, 2012.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.

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SCALE IN FEET

HALEY & ALDRICH

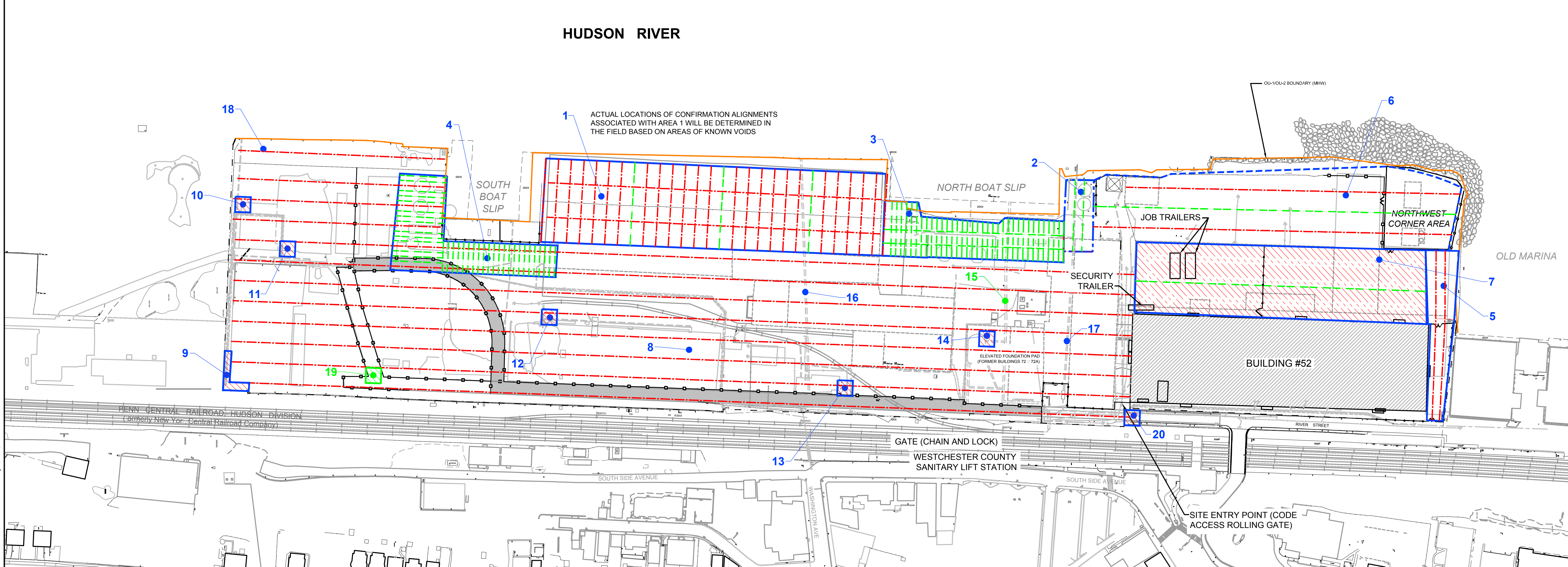
IRM DNAPL EXTRACTION SYSTEM EXPANSION
NYSDEC SITE #3-60-022
HASTINGS-ON-HUDSON, NEW YORK

DATA LOGGER INSTALLATION PLAN

SCALE: AS SHOWN
MARCH 2013

FIGURE 1R

Drawing Name: G:\28612_HASTINGS\293\CAD\28612-293-002.DWG
Operator Name: ARAGONA, KEITH
Drawing Layout: DATA LOGGER PLAN (1)
Plot Date: April 12, 2013



LEGEND

- GPR SCAN AREA
- GPR CONFIRMATION TEST LOCATIONS (ACTUAL ALIGNMENT MAY VARY)
- FULL SCALE TRANSECT LOCATIONS (ACTUAL ALIGNMENT MAY VARY)
- PROPERTY LINE
- RAIL ROAD
- EXISTING STRUCTURES
- FORMER STRUCTURES
- EXISTING FENCE
- TEMPORARY FENCE
- PERMANENT FENCE
- EXISTING BUILDING
- RIP-RAP
- UG DRAINS / SEWER TO RIVER
- ACCESS ROAD TO ADJACENT PROPERTY
- OVERHEAD ELECTRIC
- ELECTRICAL
- EXISTING UTILITY POLE

NOTES

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006)
2. OTHER SITE FEATURES BASED ON VARIOUS HISTORICAL DOCUMENTS.
3. ALL PERMANENT FENCE POSTS WERE INSTALLED TO 2 FEET BGS USING HYDRAULIC HAMMER.
4. ACTUAL GPR ALIGNMENTS AND LENGTHS MAY VARY BASED ON FIELD CONDITIONS.

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HALEY & ALDRICH

IRM DNAPL EXTRACTION SYSTEM EXPANSION
NYSDEC SITE #3-60-022
HASTINGS-ON-HUDSON, NEW YORK

GPR INVESTIGATION PLAN

SCALE: AS SHOWN
MARCH 2013

FIGURE 2R

Drawing Name: G:\28612_HASTINGS\255_IRM DESIGN\CAD\DRAWINGS\R2\DRAWINGS\BASE BID_DNAPL\28612-257-SITE WALK-02.DWG
Plot Date: April 12, 2013
Operator Name: ARAGONA, KEITH
Drawing Layout: GPR_

APPENDIX 2

OU-1 Supplemental Investigation Plan

APPENDIX 2

OU-1 SUPPLEMENTAL INVESTIGATION PLAN

1. INTRODUCTION

This plan describes supplemental onshore investigation activities for OU-1. This task is part of the overall pre-design investigation (PDI) that will be completed at the Former Anaconda Wire & Cable Company site (Site), NYSDEC Site # 3-60-022, located on the east shore of the Hudson River at 1 River Street, Hastings-on-Hudson, New York.

2. BACKGROUND

In order to support the remedy design, several data collection tasks will be conducted. Data gaps that have been identified include updating the current groundwater model, identification of subsurface voids along the shoreline, and investigation of subsurface anomalies, which includes subsurface features that may require special consideration during remedial design (e.g. vaults, sumps, etc.). The primary purpose of these tasks include identifying: subsurface structures or voids that my pose a safety risk to operation of heavy equipment during remedy implementation, subsurface features that may contain residual PCBs, and other anomalies that may require additional investigation.

3. SCOPE OF WORK

The goal of this task is to obtain additional information to support the final remedy design. This plan describes the approach to complete the following tasks:

- Install groundwater wells and operation of pressure transducer data loggers
- Complete baseline sampling of site groundwater
- Evaluate voids adjacent to the shoreline
- Investigate other subsurface anomalies
- Investigate Buildings 15 and 52 outfalls
- Confirm and document existing underground utilities that will remain in place, be relocated, be abandoned, or be removed.

3.1 Groundwater Levels

3.1.1 Monitoring Well Installation

The proposed work scope includes the installation of seven monitoring wells: five shallow wells screened in the Fill unit, and two deep wells screened in the Basal Sand unit (Figure 2-1). Well locations were chosen to establish coverage to better understand tidal influences on the groundwater beneath the site and variation of hydraulic gradients with distance east of the Hudson River for updating the groundwater model. Hydraulic gradients and tides are important parameters which will affect groundwater modeling in support of remedial design.

Monitoring wells will be installed using standard drilling techniques. Shallow wells will be installed to the top of the Marine Silt at depths varying from 15 to 30 feet below ground surface (bgs). Deep monitoring wells will be installed to depths varying from 50 feet near the eastern boundary of the site to 90 feet near the Hudson River. Both shallow and deep wells will be constructed using two-inch-diameter PVC screen (0.010-slot) and riser with appropriately sized sand filter pack. The top of the filter pack will be placed at least two feet above top of screen. A bentonite seal at least two feet in thickness will be placed above the filter pack. Monitoring wells will be grouted to within two feet of ground surface with cement/bentonite grout and will be completed with locking compression caps and flush-mount or stickup well covers. Monitoring wells with flush-mount surface completions will be appropriately marked to facilitate future locating for monitoring activities. Monitoring well construction will be similar to wells installed during previous investigation activities; typical construction logs for shallow and deep wells are shown in Attachment 1. Actual construction specifications may vary based on observed field conditions.

3.1.2 Transducer Deployment

In addition to groundwater level data loggers (pressure transducers) installed during Phase 1 (Appendix 1), additional pressure transducers will be deployed in the newly installed monitoring wells as shown in Figure 2-1.

Pressure transducers will be capable of recording approximately 40,000 data points. Data recording frequency will be calibrated to best support modeling and design objectives. Groundwater levels will be measured manually at each location immediately following deployment of each transducer and during each download event. Barometric pressures will be monitored at an on-site location and will be used to correct water level records for atmospheric variations. Data will be downloaded from the data loggers approximately every two months for a minimum of six months.

3.2 Groundwater Sampling

Baseline groundwater sampling will be completed to monitor shallow groundwater prior to remedial construction to evaluate the long term effectiveness of the remedy. During the 2006 PDI for OU-1, monitoring wells MW-01A, MW-03A, MW-05, MW-07, and MW-09 were sampled. MW-07 and MW-03A are no longer suitable for collection of groundwater samples. In addition to the three site wells, three upgradient wells are included in the program. The monitoring wells selected for baseline sampling are described below and shown on Figure 2-3.

Upgradient Wells

- PDMW-16S (southeast corner)
- PDMW-20S (east central)
- PDMW-19S (northeast corner)

Site Wells

- MW-01A (southwest corner)
- MW-09 (northern shoreline)
- MW-05 (northwestern shoreline)

Baseline groundwater sampling will be completed during the PDI and then annually thereafter until the beginning of construction. The monitoring wells included in the baseline sampling program may be modified based on sampling results. The plan and schedule for post-construction groundwater sampling will be submitted at a later time.

The condition of wells proposed to be included in baseline sampling will be evaluated during the PDI to determine usability for sampling. Groundwater samples will be collected using low flow techniques and analyzed for PCBs, beryllium, copper, lead, and zinc.

3.3 Void Assessment

There are several areas of the Site where evidence of soil erosion or subsidence beneath the concrete slab have been observed. Observations include large holes in the concrete and large void spaces that expose former building foundation structures. These areas are predominantly located between the north and south boat slips. A better understanding of the depth and extent of void spaces beneath the slab is required to:

1. Plan where activities can be safely completed and
2. Provide data to estimate fill quantities.

Void extents will be evaluated through a ground penetrating radar (GPR) program and voids survey. Once the results of the GPR are confirmed (and additional GPR surveys conducted as required), the voids survey will be completed by constructing multiple transects along the shoreline between the north and south boat slips (Figure 2-2). A hammer drill or coring machine will be used to penetrate the concrete so that contact of fill material with the concrete and the concrete thickness can be assessed. The depth from the bottom of the concrete to the top of the fill material will be measured at each location. Once the initial investigation is complete, larger concrete cores will be completed at select locations (approximately 5 - 8) in order to visually confirm measurement results.

3.4 Subsurface Anomalies

There are several areas of the site in which subsurface anomalies (e.g. subsurface features that require special consideration during remedial design such as vaults, sumps, LNAPL, etc.) have been identified during previous investigations and during routine site work that require additional investigation. Locations are shown in Figure 2-2. Investigation of these areas is required to:

1. Assess previously identified significant voids to reduce the potential for safety incidents during construction.
2. Evaluate potential residual material which may be present in the subsurface and/or within features.

The potential presence of other relevant subsurface features will be evaluated using results of previous investigations, evaluation of historical drawings, interviews with site employees, and site reconnaissance. These areas may be investigated using a combination of techniques including coring the surface and using a down hole camera, limited excavation (for the purposes of exposing subsurface structures), lifting manhole and vault lids for inspection, and/or completion of soil borings. Samples may be collected based on field observations. Once subsurface anomalies have been exposed, investigated, and/or evaluated, the area will be surveyed and secured.

3.5 Outfall Investigations

3.5.1 Building 15

Two test pits will be completed to evaluate the presence of the Building 15 outfall. Once the alignment of the outfall has been identified, test pit locations will be determined based on field conditions.

Test pits will be completed by saw cutting and removal of the concrete slab to expose the soil. Soil will be excavated and stockpiled to expose the pipe. Once the pipe is exposed, measurements and materials of construction will be recorded. Additionally, samples of the bedding material will be collected and analyzed determine the concentration of lead, copper, and zinc. Excavation spoils resulting from test pits will be used as backfill material.

3.5.2 Building 52

Outfalls that conveyed water from Building 52 to the Hudson River will be further investigated to determine potential PCB impacts to the subsurface resulting from former operations within the building.

This will be completed using a multimodal approach as described below.

- Previously test pits were completed at several locations exposing the pipe; samples of the pipe bedding were collected. These documents will be reviewed and the data incorporated into the current investigation program.
- If, based on review of the data from historical evaluations, additional data is required to assess the potential presence of PCBs adjacent to the outfalls, then test pits will be completed. Test pit locations will be determined based on results of document review. Once the pipe is exposed, measurements and materials of construction will be recorded. Additionally, samples of the pipe bedding and adjacent soils may be collected and analyzed to determine the concentration of PCBs. Excavation spoils resulting from test pits will be used as backfill material.
- If, based on test pitting results, the concentration of PCBs are present at concentrations that exceed removal criteria in soil adjacent to the pipe, then existing sampling information will be reviewed and, if necessary, borings may be completed to further evaluate the extents of PCB impacts.

3.6 Evaluate Existing Underground Utilities

The presence, locations, and general conditions of existing utilities will be evaluated for the purposes of determining utilities that enter and exit the site from offsite locations. Additionally, utilities that have been abandoned or are no longer in use will be documented. This information will be incorporated into the design that may determine future easements and discharge permits required. Data collection to support the civil design portion of the remedial design will focus on confirming the locations of existing active utilities that will remain on site after completion of the remedy, be removed or abandoned during completion of the remedy, re-located in support of site redevelopment plans, or protected during construction. Specific civil design components of the remedial design that require special consideration with respect to existing underground utilities may include:

- Grading and drainage: design components may include storm water controls, site ingress/egress, incorporation of existing structures to remain post remedy, and design of grade transitions to adjacent parcels
- Public works utilities, including storm water system, sanitary system, and water supply
- Shore protection and 100 Year Flood Plain; and
- Protection of utilities during construction

The objectives of the activities in this section are to determine the location and condition of existing active utilities on site as follows:

1. The 48-inch Hastings Creek conduit alignment; the location of this alignment identified on surveyed drawings conflicts with field observations. The location of the outfall to the Hudson River is depicted differently on the 2005 Boswell as survey compared to historical drawings. Additionally, the site entrance location from beneath the rail road tracks has not been determined.
2. The 18-inch storm drain/sewer overflow pipe that extends from the existing Westchester County sanitary pump station; the location of this utility has not been verified.
3. The 18-inch storm drain which discharges at a location south of the North Boat Slip; the location of this alignment has not been verified. Additionally, the location at which the storm drain enters the site from the east has not been determined.
4. The alignment of a 30 inch outfall observed in the northern portion of the North Boat Slip.

Additionally, the location of the sanitary sewer will be documented and the abandonment of gas, potable water, and electric utilities which formerly serviced the site will be confirmed.

Methods that will be used to complete the scope may include:

- Requesting data from municipalities to determine the approximate alignment of the utility.
- Locate manholes and document and survey inverts.

Upon completion of this work, storm sewer pipe profiles will be completed based on invert information. Based on this information, additional investigation may be required at a future date to further evaluate the utility including:

- Test pitting to document the materials of construction, location, and condition of the pipe.
- Smoke and/or dye testing to determine the routing and/or outfall locations.
- Video inspection to determine the condition of the interior of the pipe.

3.7 Laboratory Testing

Samples collected to evaluate exceedances of PCB concentrations will be analyzed by a NYS-certified chemical analytical laboratory by EPA Method 8082A for PCB Aroclors.

3.8 Operating Procedures

The following operating procedures (OP's) are pertinent and are located in Appendix A.

OP3027 – Decontamination Procedure
OP3001 - Preservation and Shipment of Environmental Samples
OP3026 - Chain of Custody
OP3029 – Field Data Recording
OP3030 - Field Instruments: Use and Calibration
OP3012 - Low Stress/Low Flow Groundwater Sample Collection Procedure

4. QUALITY ASSURANCE

Appendix A of the RDWP provides a Quality Assurance Project Plan (QAPP).

5. SUBMITTALS

Applicable data will be included in the PDI Data Summary Report.

6. HEALTH AND SAFETY

Health and safety requirements applicable to all persons entering the site or involved in field activities are described in the Site-specific Health Safety Security and Environmental Plan (HSSEP), these documents will be available for use on Site prior to the commencement of work.

7. ATTACHMENTS

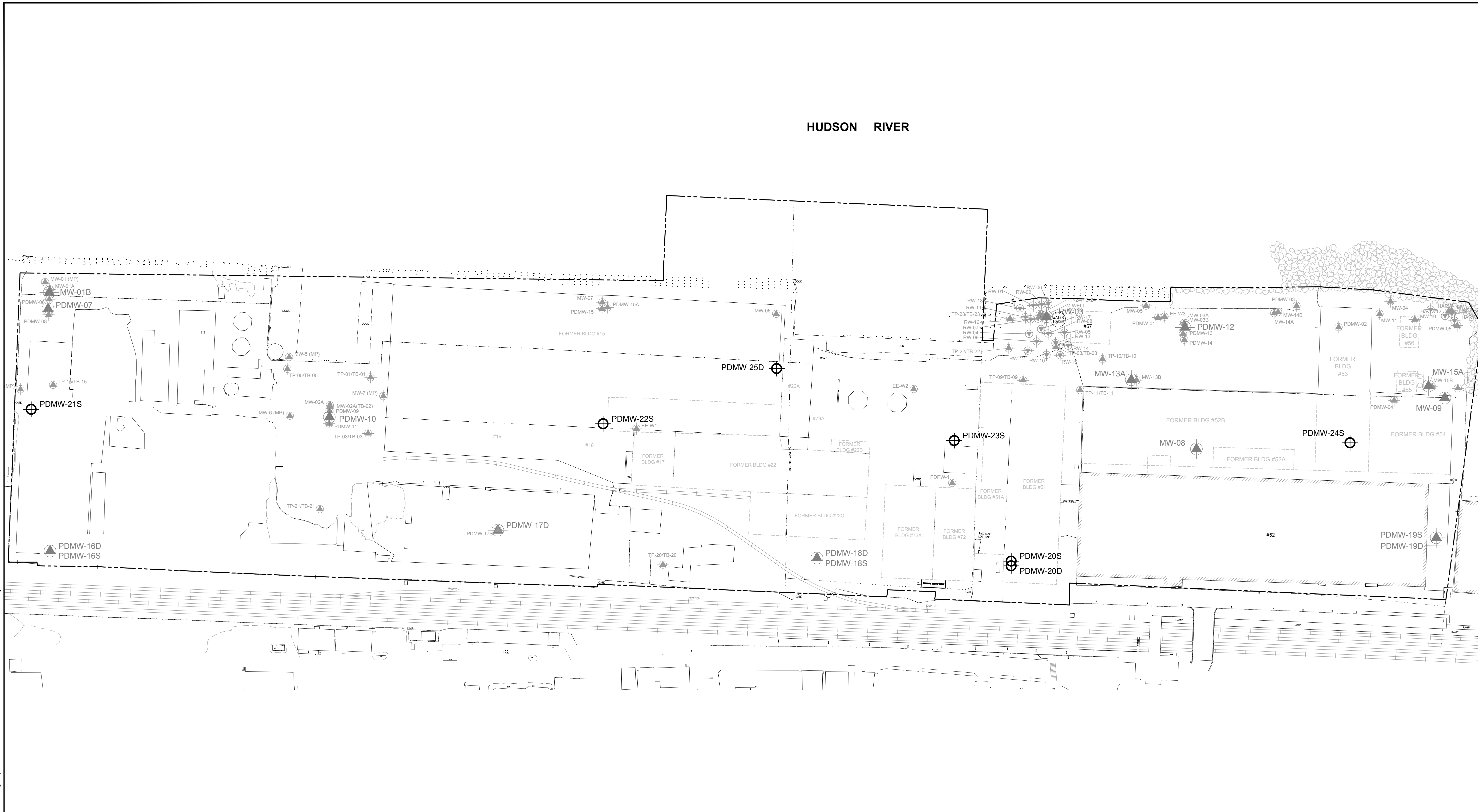
FIGURES

Figure 2-1 Proposed Groundwater Well Installation Plan
Figure 2-2 Proposed Voids Survey and Subsurface Anomaly Investigation
Figure 2-3 2013 PDI Groundwater Well Sampling Locations

ATTACHMENT 1

Example Monitoring Well Construction Logs (2006 PDI)

https://hank.haleyaldrich.com/sites/projects/28612/Shared Documents/RDWP/RDWP App 2/2014-0221-App 2 - OU-1 Supplemental-DF.docx



Plot Date: May 23, 2013

Drawing Name: G:\28612_HASTINGS\293\CAD\28612-293-007 PROP DATA LOGGER-D2.DWG
Operator Name: ARAGONA, KEITH
Drawing Layout: FIG 2-1

LEGEND

- PROPERTY LINE
- RAIL ROAD
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RETAINING WALL
- MONITORING WELL
- RECOVERY WELL
- PROPOSED WELL (PART OF DATA LOGGER INSTALLATION PLAN)
- MONITORING WELL (PART OF DATA LOGGER INSTALLATION PLAN)

NOTES

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. PROPERTY BOUNDARY INFORMATION PROVIDED BY WENDEL COMPANIES, DRAWING XVE-HUDSON-TOPO.DWG, PROJECT NO. 438504, DATED SEPTEMBER 21, 2012.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.
5. MONITORING WELLS DESIGNATED AS SHALLOW (I.E. PDMW-20S) WILL BE COMPLETED IN THE FILL MATERIAL. MONITORING WELLS DESIGNATED AS DEEP (I.E. PDMW-20D) WILL BE COMPLETED IN THE BASAL SAND.

W S N E

0 80 160 240 320
SCALE IN FEET

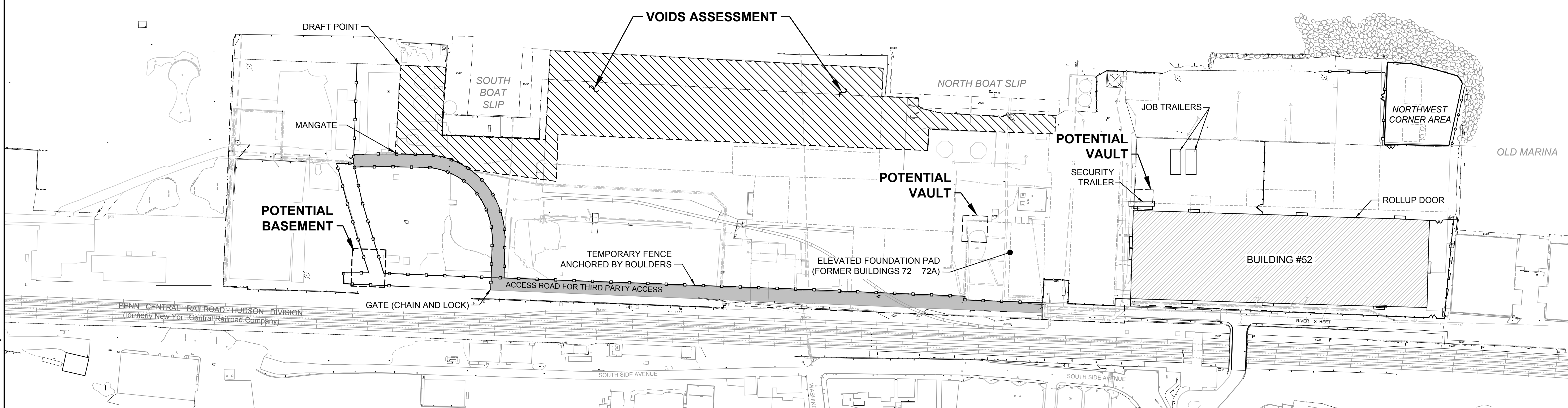
HALEY & ALDRICH

IRM DNAPL EXTRACTION SYSTEM EXPANSION
NYSDEC SITE #3-60-022
HASTINGS-ON-HUDSON, NEW YORK

PROPOSED WELLS - DATA LOGGER INSTALLATION PLAN

SCALE: AS SHOWN
MAY 2013

FIGURE 2-1



UNKNOWN SUBSURFACE ANOMALY INVESTIGATION LOCATIONS

Plot Date: May 23, 2013

Drawing Name: G:\28612_HASTINGS\293\CAD\28612-293_006 VOIDS SURVEY.DWG
Operator Name: ARAGONA, KEITH
Drawing Layout: FIG 2-2

LEGEND

- PROPERTY LINE
- RAIL ROAD
- EXISTING STRUCTURES
- FORMER STRUCTURES
- EXISTING FENCE
- TEMPORARY FENCE
- PERMANENT FENCE
- RIP-RAP
- UG DRAINS / SEWER TO RIVER
- ACCESS ROAD TO ADJACENT PROPERTY
- OVERHEAD ELECTRIC
- ELECTRICAL
- EXISTING UTILITY POLE

NOTES

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006)
2. OTHER SITE FEATURES BASED ON VARIOUS HISTORICAL DOCUMENTS.
3. ALL PERMANENT FENCE POSTS WERE INSTALLED TO 2 FEET BGS USING HYDRAULIC HAMMER.
4. CONTRACTOR RESPONSIBLE FOR CONFIRMING ALL OBSTRUCTIONS TO COMPLETING WORK SCOPE.

W S N E

0 100 200 300 400
SCALE IN FEET

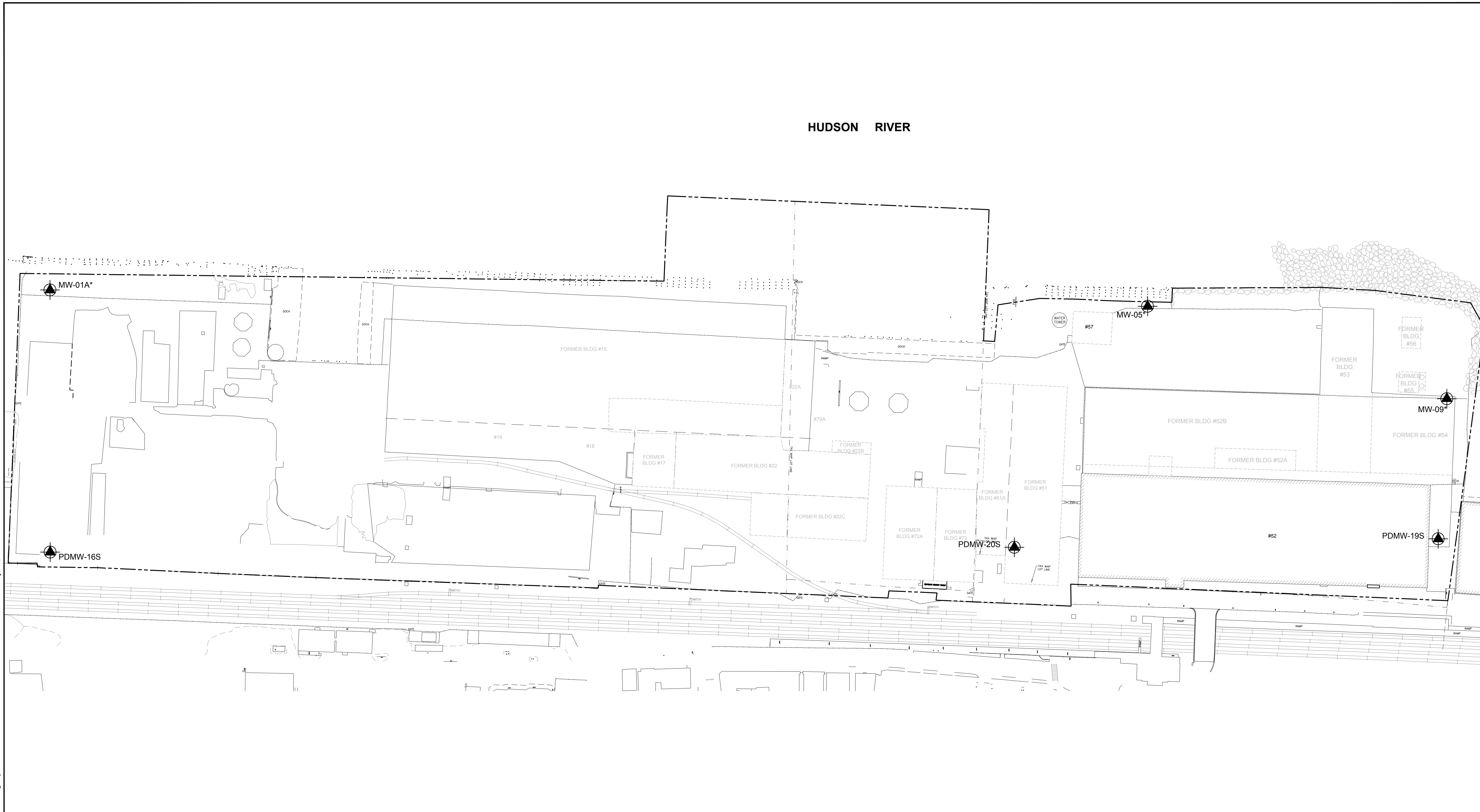
HALEY & ALDRICH

IRM DNAPL EXTRACTION SYSTEM EXPANSION
NYSDEC SITE #3-60-022
HASTINGS-ON-HUDSON, NEW YORK

VOIDS SURVEY - SUBSURFACE ANOMALY INVESTIGATION

SCALE: AS SHOWN
MAY 2013

FIGURE 2-2



LEGEND

- PROPERTY LINE
- RAIL ROAD
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RETAINING WALL
- MONITORING WELL

NOTES

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. PROPERTY BOUNDARY INFORMATION PROVIDED BY WENDEL COMPANIES, DRAWING XVE-HUDSON-TOPO.DWG, PROJECT NO. 438504, DATED SEPTEMBER 21, 2012.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.

W S N E

0 80 160 240 320
SCALE IN FEET

HALEY & ALDRICH

IRM DNAPL EXTRACTION SYSTEM EXPANSION
NYSDEC SITE #3-60-022
HASTINGS-ON-HUDSON, NEW YORK

2013 OU1 PDI GROUNDWATER WELL SAMPLING LOCATIONS

SCALE: AS SHOWN
FEBRUARY 2014

FIGURE 2-3

Drawing Name: X:\293\CAD\2006 OU1 SAMPLING_D2.DWG
Operator Name: MORA, ANA
Drawing Layout: FIG 2-3
Plot Date: February 19, 2014

ATTACHMENT 1

Example Monitoring Well Construction Logs (2006 PDI)

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. **PDMW-19S**
Boring No. **PDMW-19**

PROJECT	ONE RIVER STREET	**H&A FILE NO.**	28612-118
LOCATION	HASTINGS ON HUDSON, NY	**PROJECT MGR.**	W. HARDISON
CLIENT	ATLANTIC RICHFIELD COMPANY	**FIELD REP.**	J. BODE
CONTRACTOR	WARREN GEORGE, INC.	**DATE INSTALLED**	4/12/2006
DRILLER	R. BRIDGEPAL	**WATER LEVEL**	

Ground El. ______ ft **Location** SEE PLAN ☐ **Guard Pipe**
El. Datum ______ ☑ **Roadway Box**

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
	CEMENT
	0.75
	FILTER SAND
	1.5
	BENTONITE
	3.0
FILL	FILTER SAND
12.5	12.5

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

L1 L2 L3

Type of protective cover	9/16 Bolted Cover	
Height/Depth of top of roadway box above/below ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.3	ft
Type of protective casing:	Roadway Box	
Length	1.1	ft
Inside Diameter	5.0	in
Depth of bottom of roadway box	1.1	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.75
Bentonite Seal	1.5	1.5

Type of riser pipe:	Sch 40 PVC Solid	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Filter Sand / Bentonite	
Diameter of borehole	4.5	in
Depth to top of well screen	4.2	ft
Type of screen	Machine Slotted Sch 40 PVC	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	Filter Sand	
Depth of bottom of well screen	12.2	ft
Bottom of Silt trap	-	ft
Depth of bottom of borehole	12.5	ft

(Not to Scale)

4.0 ft	+	8.0 ft	+	- ft	=	12.0 ft
Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length

COMMENTS: Weather: Sun, 60°

G:\28612\118\OW Installation Report 4/26/06

Form 2007

OBSERVATION WELL INSTALLATION REPORT

HALEY & ALDRICH

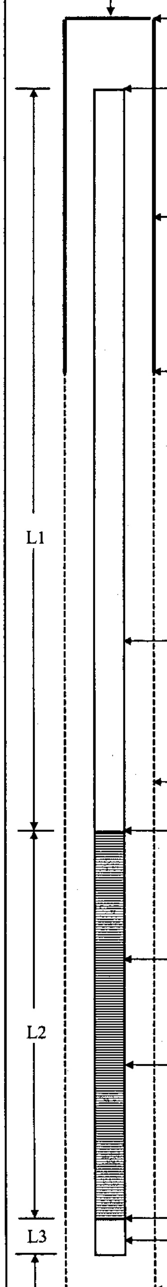
Well No.	PDMW-19D
Boring No.	PDMW-19

PROJECT	ONE RIVER STREET	**H&A FILE NO.**	28612-118
LOCATION	HASTINGS ON HUDSON, NY	**PROJECT MGR.**	W. HARDISON
CLIENT	ATLANTIC RICHFIELD COMPANY	**FIELD REP.**	J. BODE
CONTRACTOR	WARREN GEORGE, INC.	**DATE INSTALLED**	4/10/2006 to 4/11/2006
DRILLER	R. BRIDGEPAL	**WATER LEVEL**	

Ground El. ______ ft **Location** SEE PLAN ☐ **Guard Pipe**
El. Datum ______ ☑ **Roadway Box**

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
FILL	CEMENT
	0.75
13.0	CEMENT GROUT
MARINE DEPOSITS (Silt)	
	35.0
37.0	BENTONITE
	40.0
MARINE DEPOSITS (Basal Sands)	FILTER SAND
48.0	48.0

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover	9/16 Bolted Cover	
Height/Depth of top of roadway box above/below ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.5	ft
Type of protective casing:	Roadway Box	
Length	1.1	ft
Inside Diameter	8.0	in
Depth of bottom of roadway box	1.1	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	0.75
Cement Grout	0.75	34.25
Bentonite Seal	35.0	4.0

Type of riser pipe:	Sch 40 PVC Solid	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite / Cement Grout	
Diameter of borehole	5.0	in
Depth to top of well screen	42.7	ft
Type of screen	Machine Slotted Sch 40 PVC	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	Filter Sand	
Depth of bottom of well screen	47.7	ft
Bottom of Silt trap	-	ft
Depth of bottom of borehole	48.0	ft

42.7 ft + 5.0 ft + - ft = 47.7 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS: Permanenet 5.0 in. steel casing installed from ground surface to 20.0 ft. Weather: Sun, 50-60°

G:\28612\118\OW Installation Report 4/26/06

Form 2007

APPENDIX 3

OU-1 Excavation Pre-delineation Plan

APPENDIX 3

OU-1 EXCAVATION PRE-DELINEATION PLAN

1. INTRODUCTION

This plan describes excavation pre-delineation activities for OU-1. This task is part of the overall pre-design investigation (PDI) that will be completed at the Former Anaconda Wire & Cable Company site (Site), NYSDEC Site # 3-60-022, located on the east shore of the Hudson River at 1 River Street, Hastings-on-Hudson, New York.

2. BACKGROUND

The Record of Decision Amendment (NYSDEC, 2012) (ROD) for Operable Unit No. 1 (OU-1) requires that:

> *"2. At the Northwest Corner of the site and along the Northern Shoreline, excavation of surface soil (0- 12 inches) containing greater than 1ppm PCB and subsurface soil containing greater than 10 ppm PCB to a maximum depth of 9 feet. Outside of the Northwest Corner and the Northern Shoreline areas, excavation of surface soil (0-12 inches) containing greater than 1ppm PCB and subsurface soil containing greater than 10 ppm PCB, to a maximum depth of 12 feet. (modified)*
> *3. Outfalls and associated pipe bedding from Building 52 that are potential PCB source areas will be excavated, sampled and removed, or decommissioned as approved by the Department. (new)*
> *4. Excavation of shallow soils from the southern portion of the site that are identified as "lead hotspots". These correspond to lead levels between 2,160 ppm and 43,200 ppm. (unchanged) "*

This excavation pre-delineation sampling program was designed to comply with excavation confirmation sampling requirements set forth in DER-10, Technical Guidance for Site Investigation and Remediation, May 2010 (DER-10). Relevant sections are excerpted below:

From Chapter & Section 5.4(b)

2. *"Confirmation samples, as defined in paragraph 1.3(b)3, are required when the limits of soil removal are to be determined by achieving a soil cleanup level in the field. Confirmation samples are to demonstrate that the remedy has achieved the soil cleanup levels identified by the decision document, determined as follows:*
    - *i. the use of averages, means or other statistical techniques are generally not allowed, however, recognizing the heterogeneity of contaminated sites and the uncertainty of sampling and analysis of samples, the DER project manager may judge that remediation is complete for sites when:*
        1. *there is a large number of confirmatory samples;*
        2. *the vast majority of confirmation samples indicate that the soil cleanup levels for the site have been achieved; and*
        3. *those that do not achieve the SCO exceed it only by a small amount; and*
    - *ii. should the remedial party disagree with the professional judgment of the DER project manager, the remedial party may submit a justification that there is a 95% confidence level that the soil cleanup levels have been achieved using the*

procedure defined in the EPA guidance document Supplemental Guidance to RAGS: Calculating the Concentration Term. USEPA Publication 9285.7-081 (May 1992). DER will evaluate this information and make a determination whether the sampling adequately documents that the objectives have been achieved."

5. *"The following are minimum confirmation sampling frequencies for soil excavations of:*
    - i. *less than 20 feet in perimeter, include one bottom sample and one sidewall sample biased in the direction of surface runoff;*
    - ii. *20 to 300 feet in perimeter, where the remedy is seeking to achieve:*
        1. *surface soil levels, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area; and*
        2. *subsurface soil cleanup levels, one sample from the bottom of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area;*
    - iii. *greater than 300 feet in perimeter, should be in accordance with either:*
        4. *subparagraph ii above; or*
        5. *a DER-approved reduced sampling frequency, where the remedial party submits a proposed sampling frequency, with supporting rationale, in accordance with section 1.6;*
    - iv. *in an excavation where multiple layers of contamination have been visually or analytically identified, additional side wall samples in the horizon in which contamination was identified are necessary;*
    - v. *each excavation within a larger excavation will be considered a separate excavation and should comply with subparagraphs i through iii above; and*
    - vi. *for side or bottom samples, for volatile organic compounds in an excavation:*
        1. *within 24 hours of excavation, they should be taken from the zero to six-inch interval at the excavation floor; or*
        2. *after 24 hours, the samples should be taken at six to twelve inches; and*
    - vii. *no water should be present in the excavation bottom where bottom samples are collected."*

3. SCOPE OF WORK

The goal of this task is to pre-delineate onshore excavation limits using pre-excavation sampling. Establishing excavation limits (area and depth) in this manner will streamline design, reduce uncertainty during construction, increase worker safety during construction, and reduce changes in the field which may result from completing excavation confirmation sampling during remedial construction. Examples of potential issues include:

- Lack of specific shoring design and potential re-installation associated with changing excavation limits
- Unknown waste volumes and water treatment needed during dewatering activities
- Unknown thickness and extent of concrete in excavation locations

This plan describes the approach to delineate the extents of excavation at locations where existing data points indicate PCB or lead above the ROD remedial action criteria (criteria). This will be accomplished by collecting supplemental data at select existing data points (resampling) and performing new explorations to delineate the horizontal and vertical extents of impacts above criteria.

The site has been generally divided into three sections in order to facilitate presentation of investigation plans and discussion of data:

1. The southern portion of the site extends from the southern property boundary northward to the south wall of Former Building 51 between the eastern property boundary and the Hudson River shoreline.
2. The northern portion of the site extends from the south wall of Former Building 51 northward to the northern property boundary between the eastern property boundary and the west edge of the Building 52B pad.
3. The northwest portion of the site extends from the northern boundary of the North Boat Slip northward to the northern property boundary between the west edge of the Building 52B pad to the Hudson River shoreline.

3.1 Existing Data

Existing onsite data are the basis for determining the locations of potential remedial excavation areas that require pre-delineation. A summary of existing on site data used as a basis of the excavation pre-delineation program can be found in the 2008 Modified Conceptual Site Model (CSM) for the site, which can be observed in Attachment 1 of this Appendix 3 of the RDWP. These data were used, where available, to establish the vertical extends of PCB soils that exceed criteria and establish the basis for new borings. In many existing boring locations, data can be used to adequately establish additional sampling locations and resampling, as required. Existing data points that do not contain adequate information will be resampled at sampling intervals where data is needed.

3.2 Pre-Delineation Sampling Program Design

The excavation pre-delineation sampling program was designed based on requirements set forth in DER-10 and quoted in Section 2 of this document. In general, excavation limits will be defined by completing additional borings in locations near existing borings with PCB criteria exceedances. The program proceeds as follows:

1) Evaluate existing locations to ‘resample’ where needed;
2) Complete sampling around the perimeter of the initials excavation limits which are typically ‘offsets’ from the existing data at specified depth intervals;
3) Based on the results of the ‘offset’ locations, the final excavation area will be established or a revised excavation perimeter will be created and ‘step out’ locations will be sampled;
4) Additional rounds of ‘step outs’ will be completed until the excavation area confirms no exceedances.

The goal of the offsets is to collect the appropriate number of samples to satisfy the requirement for “confirmation sampling” described in DER-10 technical guidance. Since the entire Site will receive a minimum of 2 feet of clean cover, NYSDOH has indicated that all existing materials which remain in place will be defined as subsurface materials whether they consist of soil or other materials (brick, concrete, etc.) and therefore must meet the subsurface exceedance criteria.

3.2.1 Horizontal Distribution of Excavation Pre-delineation Samples

In general, the excavation pre-delineation program investigates an existing criteria exceedance by sampling at a offset borings 15 feet laterally in each direction from the existing data point (See Figures 3-1, 3-2, and 3-3 for proposed resample and offset locations) resulting in a 30 foot by 30 foot gridded "investigation unit". Due to the proximity of other existing data points (above or below criteria), other subsurface features, or concentrations of PCBs relative to the exceedance criteria, many areas will require the use of a non-standard offset. Specific examples of these areas can be observed on the drawings and are described in the table. Evaluation of locations that exceed criteria will generally fall into one of three categories as described below.

1. An "isolated" existing data point describes an existing data point location in which no other data or subsurface features, which exhibits the potential to be a source of PCBs, exist in the vicinity. These areas will generally be investigated as a 30 foot by 30 foot investigation unit unless supplemental site or chemical information indicates that reducing the area is appropriate.
2. A "linear feature" is one or more data points with a criteria exceedance that may be associated with a utility or other liquid conveying site feature (e.g. outfalls and associated pipe bedding from Building 52 that are potential PCB source areas). Criteria exceedances associated with these features may be related to the gravel bedding parallel to the feature and result in horizontal distribution of impacts in the direction parallel to the feature more than in the directions perpendicular to the feature. Therefore, the approach for pre-delineating excavation limits will be to position offsets closer in the direction perpendicular to the feature (e.g. 5 feet) and the standard sampling interval (i.e. 30 feet) in the direction parallel to the feature. Presence of supplemental site or chemical information may indicate that reducing the offset distance is appropriate.
3. A "cluster" location refers to an area where multiple existing data points with criteria exceedances exist within close proximity to one another in an area greater than 900 square feet. For this case, the initial geometry of the investigation units is defined based on the existing data and offset samples are placed around the perimeter. Within a "cluster" one data point may serve as a confirmation sample for the side wall of an adjacent area.

Based on a review of the existing data and actual site conditions, there are areas in which modifications to the abovementioned approaches were encountered. Some examples of these areas are described below. Each occurrence of these exceptions is noted in Table 3-1.

1. Existing exceedances located adjacent to property boundaries. Completion of offsets or step outs during this PDI will be limited to within the property boundary. Samples completed in close proximity to property boundaries may be used as documentation samples.
2. Existing exceedances located adjacent to Building 52 or other structures. Offsets adjacent to Building 52 may be used as documentation samples. PCBs are present at concentrations that exceed removal criteria beneath Building 52 as identified in the CSM. No sampling within Building 52 is included in this PDI. If the long term status of Building 52 changes, a separate pre-delineation plan for the building may be completed.
3. Multiple linear features in close proximity to each other. In these instances, offsets may straddle both utilities.

4. Existing data points that exhibit concentrations of PCBs only slightly higher than exceedance criteria. Within areas that do not indicate the presence of widespread impacts above criteria, offsets may be located less than 15 feet from the existing data point.

The initial sampling sequence will be evaluated prior to PDI execution. Explorations will be completed strategically so that sample results can be used to refine offset and step-out locations and depth intervals. Modifications will be discussed with the DEC prior to altering the sampling location plan.

In the event that an exceedance is observed in offset samples, a new perimeter will be established. Step out borings will be determined considering field conditions in the vicinity, concentrations observed, etc. If exceedances occur after multiple step out attempts, alternate methods to delineate PCB criteria exceedances may be reviewed with NYSDEC.

3.2.2 Structure of Table 3-1

Table 3-1 provides important information about each excavation area. Below is a description of each column in the table.

Excavation Area ID	Area Type	Existing Samples in Area	Notes / Exceptions
Each excavation area is provided a unique ID as defined in figures.	Identifies the approach (isolated, linear feature, cluster) selected for pre-delineation.	Lists each existing location with a criteria exceedance within the area.	Describes supplemental information about the excavation area, modifications to the standard approach, etc.

3.2.3 Vertical Distribution of Excavation Pre-delineation Samples

Similar to the horizontal pre-delineation, the vertical (bottom) extents of PCB criteria exceedances within each excavation area will be established through pre-excavation sampling and analysis. Sampling depths intervals will be determined relative to existing grade.

Determination of excavation limits requires sidewall and bottom samples that exhibit concentrations of PCBs below exceedance criteria as follows:

- Bottom sample will be collected as required. Note that the initial excavation depth will be established as the top of the clean sampling interval (e.g. if the existing data point (or resample) indicates the presence of PCBs below criteria at a depth of 8 – 10 feet and above criteria at 6 – 8 feet, then the excavation bottom would be established at 8 feet).
- Bottom of sidewall samples will be collected from borings at the bottom two foot interval of the proposed excavation.
- Horizon samples will be collected, if applicable, at sidewalls (i.e. offsets and step outs) where multiple horizons of exceedances are identified in the existing sample location:

    - At intervals of elevated concentrations which are separated by an interval with significantly lower concentrations.

Vertical sampling intervals will be:

- 0-2 ft for lead hotspots
- Two foot intervals for bottom of excavation samples
- Horizon samples, if applicable, will be collected at the 2 foot interval that corresponds with interval of elevated concentration identified in the existing data point.

Sample interval depths have been identified to define maximum excavation depths as follows:

- 9 feet bgs in the Northern Shoreline Area
- In other areas of the site where PCB impacts above criteria extend below 12 feet, excavation pre-delineation sampling may be proposed to stop at 9 feet. The DEC will be consulted in these specific areas prior to altering the sampling program.

Lead hotspot locations have a pre-determined excavation depth of 2 ft. Therefore, offset borings will only be completed to determine the horizontal distribution of subsurface impacts as specified in the ROD.

If exceedances occur after multiple step out attempts, alternate methods to delineate PCB criteria exceedances may be reviewed with NYSDEC.

3.3 Excavation Pre-delineation Sampling Methods

3.3.1 Survey Control

Existing boring locations will be located via survey and marked for the purposes of resampling, where required, and establishment of perimeter or offset locations.

3.3.2 Concrete and Pavement Coring

Many potential excavation locations are overlain by concrete 6 inches or more in thickness or by asphalt. These areas will be cored using a 6 to 10 inch core barrel to access the subsurface. The diameter of each core will be dependent upon the total anticipated depth of each sample. Each cored sampling location will be surveyed and recorded on field forms.

3.3.3 Surface and Shallow Soils Sampling

A 3-inch diameter by 6-inch long steel hand auger will be used to collect shallow soils (up to approximately 2 feet in depth). Hand auger tools will be decontaminated between borings.

3.3.4 Mid-Depth Soils Sampling

Utilities and other subsurface obstructions at all exploration locations will be hand cleared to a depth of approximately 6 – 7 feet. This will be completed by excavating using an air knife or other clearing technique to each target sampling depth. An air knife consists of using high pressure, compressed air to loosen soils while a vacuum removes the soils from the hole. Once the target depth is reached, a hand auger will be used to collect the sample. The air knife will be used after samples are taken to increase the boring diameter to allow for additional sampling. This process of air knifing/hand augering will continue until a sampling depth of 6-7 feet. The water table in many portions of the site is less than six feet bgs. Attempts will be made to continue hand clearing below the water table. Sampling tools and equipment that comes into contact with potentially contaminated soils will be decontaminated between borings.

3.3.5 Deep Soils Sampling

A mini-sonic drill rig will be used to collect samples at depths greater than 6 – 7 feet or below water table if other techniques are unsuccessful. Borings will be advanced using standard drilling techniques provided by the drilling contractor. Drilling tools will be decontaminated between borings.

3.4 Laboratory Testing

Soil samples will be analyzed by a NYS-certified chemical analytical laboratory by EPA Method 8082A for PCB Aroclors and EPA 3015/6010B to evaluate exceedances of PCB and lead concentrations, respectively.

The table below summarizes the extent of sample collection based on the initial investigation. These locations and samples are limited to offset sampling but is should be noted that additional samples will be collected, as required, based on initial sampling results.

PDI Activity	No. of Offsets (Step outs are TBD)	Medium/ Matrix	Sampling Depths (ft.)	Analytical Parameter
South Area (Lead Hotspots)	4 locations 1 sample per location	Soil	0-2	Lead
South Area	59 locations Typically 2-3 samples per location	Soil	Samples will be collected at 2 foot intervals up to 14 as appropriate.	PCBs
North Area	81 locations Typically 2-3 samples per location	Soil	Samples will be collected at 2 foot intervals up to 14 as appropriate.	PCBs
Northwest Area	72 locations Typically 2-3 samples per location	Soil	Samples will be collected at 2 foot intervals up to 9 feet as appropriate.	PCBs

3.5 Operating Procedures

The following operating procedures (OP's) are pertinent and are located in Appendix A.

OP2000 - Monitoring Field Explorations
OP2001 - Identification and Description of Soils Using Visual-Manual Methods
OP3001 - Preservation and Shipment of Environmental Samples
OP3003HOH – Subsurface Soil Sampling
OP3026 - Chain of Custody
OP3027 – Decontamination Procedure
OP3029 – Field Data Recording
OP3030 - Field Instruments: Use and Calibration

4. QUALITY ASSURANCE

Appendix A of the RDWP provides a Quality Assurance Project Plan (QAPP).

5. SUBMITTALS

Applicable data will be included in the PDI Data Summary Report.

6. HEALTH AND SAFETY

Health and safety requirements applicable to all persons entering the site or involved in field activities are described in the Site-specific Health Safety Security and Environmental Plan (HSSEP), these documents will be available for use on Site prior to the commencement of work.

7. ATTACHMENTS

Table 3-1 – Excavation Area Sample Location Rationale
Figure 3-1 – Proposed Explorations (South Area)
Figure 3-2 – Proposed Explorations (North Area)
Figure 3-3 – Proposed Explorations (Northwest Area)
Attachment 1 – 2008 Modified CSM Figures

8. REFERENCES

DER-10 Technical Guidance for Site Investigation and Remediation

Modified Conceptual Site Model, Harbor at Hastings Site, Haley & Aldrich of New York 2008

TABLE 3-1
EXAMPLE SAMPLING RATIONALE FOR OU1 PRE-EXCAVATION DELINEATION PROGRAM

Excavation Area ID PD2-EL-XX	Area Type	Existing Samples in Area	Notes/Exceptions (describe non-standard information/condition)
SOUTH			
SA	Linear	HB-01 SB-012 + DUP SB-112 SB-118	The existing data points are located adjacent to the property boundary and a building slab. Existing soil data indicates exceedances adjacent to a property boundary. Completion of offsets or step outs during this PDI will be limited to the property boundary. During the preliminary design, samples completed in close proximity may be used as documentation samples. Existing data point SB-146 (below criteria at the target sampling interval) located 40 feet west of SB-118 indicates a westwardly offset of 15 ft may be sufficient to establish excavation limits. Since data associated with exceedances within SB-112 and SB-012 does not appear to be associated with an underground utility and may be limited by the concrete slab, the northerly offset will be 15 feet and the westardly offset will be placed approximately 3 feet inside the slab.
SB	Linear	SB-152 PDSS-11	This existing data point is located adjacent to the property boundary. Existing soil data indicates exceedances adjacent to a property boundary. Completion of offsets or step outs during this PDI will be limited to the property boundary. During the preliminary design, samples completed in close proximity may be used as documentation samples. Existing data point PDSS-11 (below criteria at the target sampling interval) located adjacent to SB-152 indicates a non standard offset (7.5 feet due to presence of PDSS-11) shown on the drawing may be sufficient to establish excavation limits.
SC	Isolated	SB-111	Due to the low concentration of PCBs (relative to the removal criteria) at the existing data point, 10 ft offsets may be sufficient to establish excavation limits.
SD	Isolated	HB-06 PDSB-36	Existing data indicates exceedances are limited to the upper 2 ft, which lies in the footprint of the shoreline slope back cut area. Since a large area will removed for the slope back construction, pre-delineation is not require at this time.
SE	Linear	PDSB-100/ SB-088	Based on historical data review, PDSB-100 appears to be a resample of the missing interval at SB-088 and therefore additional data refinement is not required. Existing soil data indicates exceedances are located within 4 feet of a property boundary. Completion of offsets or step outs during this PDI will be limited to the property boundary. During the preliminary design, samples completed in close proximity may be used as documentation samples. Due to the low concentration of PCBs (relative to the removal criteria) at the existing data point, 15 ft offsets (to the east and west) and an offset on the north side of the suspected adjacent utility may be sufficient to establish excavation limits.
SF	Isolated	EE-04 + DUP PDSB-102	The field duplicate associated with EE-04 indicates the results in the 5-7 ft interval were 2.9 mg/kg. Based on the sample results of field duplicate collected at EE-04 and the proximity of PDSB-102 to EE-04, removal criteria does not appear to be exceeded and additional investigation is not required.

TABLE 3-1
EXAMPLE SAMPLING RATIONALE FOR OU1 PRE-EXCAVATION DELINEATION PROGRAM

Excavation Area ID PD2-EL-XX	Area Type	Existing Samples in Area	Notes/Exceptions (describe non-standard information/condition)
SG	Cluster	EE-01 EE-02 EE-03 + DUP MW-01A PDSB-36 SB-147 SB-148	Excavation will be evaluated as a cluster of points due to locations of seven existing data points (three exceedances, four non-exceedances). Existing data points indicating non exceedances are being used as excavation boundaries. Some of these locations require additional sampling in order to coincide with target sampling intervals. The field duplicate associated with EE-03 indicates the results in the 5-7 ft interval were 5.6 mg/kg (non-exceedance).
SH	Isolated	SB-058 PDSB-37	Existing data points lie within shoreline slope back area. A non standard 12 foot offset was chosen due to the presence of PDSB-37, which exhibits a known bottom at 2-4 feet.
SI	Isolated	SB-131	Total Lead Exceedance (no PCB exceedances) at 0-2 ft
SJ	Isolated	SB-128	Total Lead Exceedance (no PCB exceedances) at 0-2 ft
SK	Isolated	SB-100	Total Lead Exceedance (no PCB exceedances) at 0-2 ft
SL	Isolated	PDSB-106	Non-standard excavation shape recommended due to possibility of building foundation or utility limiting potential limits of excavation. The utililty is a sanitary sewer and likely is not a source of PCBs.
SM	Isolated	SB-095A	Due to the low concentration of PCBs (relative to the removal criteria) at the existing data point and the proximity of PDSS-14, an offset of 5 ft may be sufficient to establish excavation limits.
SN	Isolated	PDSB-109	Due to the proximity of PDSS-21, PDSB-109 may be in the vicinity of a sump. Therefore, 7.5 ft offsets may be sufficient to establish excavation limits.
SO	Isolated	SB-077 PDSS-06	Existing slab may limit northerly extents of PCBs. Existing data point PDSS-06 indicates west excavation boundary.
SP	Linear	SB-093	Historical data indicates a second concrete slab is located approximately 2-4 ft below surface slab. Offset locations are nonstandard due to location of trench with respect to existing data point SB-093.
SQ	Linear	SB-069	Offset locations are nonstandard due to location of trench with respect to existing data point SB-069.

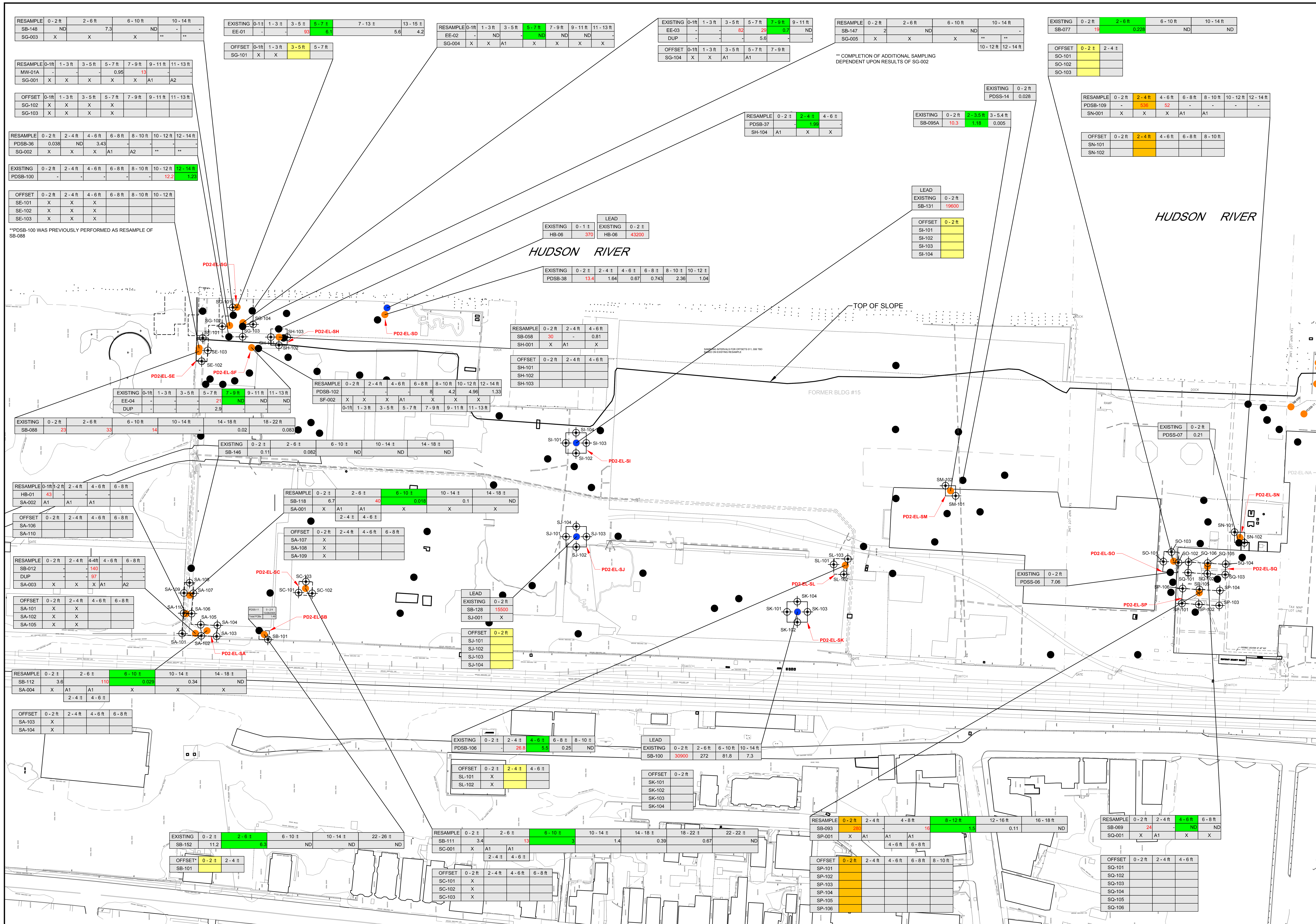
TABLE 3-1
EXAMPLE SAMPLING RATIONALE FOR OU1 PRE-EXCAVATION DELINEATION PROGRAM

Excavation Area ID PD2-EL-XX	Area Type	Existing Samples in Area	Notes/Exceptions (describe non-standard information/condition)
NORTH			
NA	Isolated	SB-085	Due to the low concentration (relative to removal criteria) of PCBs at one interval and significantly lower concentrations at deeper depths, an offset of 7.5 ft may be sufficient to establish excavation limits. Exceedances at 18-22 ft depth indicates that PCBs cannot be removed to below criteria at 12 feet and, therefore, the bottom of excavation may be established at 9 ft.
NB	Isolated	SB-082	Due to the low concentration of PCBs (relative to the removal criteria) at the existing data point, an offset of 7.5 ft may be sufficient to establish excavation limits.
NC	Linear	SB-075 SB-076 SB-153 TB-14	Long Linear feature containing several existing data points exhibiting PCB impacts above removal criteria at multiple depths. A 12 foot offset to the east was chosen due to low concentrations of PCBs (relative to the removal criteria) in existing borings located approximately 20 feet east of SB-153 (EE-10 and PDSB-114).
ND	Isolated	PDSB-14	Standard offsets will be completed for an Isolated point.
NE	Isolated	SB-103	Standard offsets will be completed for an Isolated point.
NF	Isolated	PDSB-16 PDSB-111	High concentration of PCBs deep may indicate the presence of a sump. Additional samples will be collected at the existing location in order to establish a bottom of excavation depth. Due to the presence of a potential sump, a non standard offset was chosen in order to define the limits of excavation. These borings are in the vicinity of an existing construction trailer, which is secured to the slab. Offset locations may vary slightly in order to accomodate this site feature.
NG	Linear	PDSB-31	This area will be investigated as a standard Linear. However, due to the presence of Building 52, NG-101, NG-102, and NG-103 will serve as documentation samples. Excavation is not expected to be completed within 4 feet of Building 52 wall.
NH	Linear / Cluster	PDSB-26 SB-072 SB-073 SB-079 SB-080 SB-081	Cluster area composed of a Linear and Isolated locations extending from the Building 52 wall to the west. Excavation areas evaluated as isolated points are located on the north and south sides of the Linear with impacts present in the existing sample at varying depths. Existing samples and additional samples will be used to evaluate changes in excavation depths within the footprint.
NI	Linear	SB-084 SB-151	Existing data points associated with this area may or may not be associated with subsurface utilities. Offsets from these existing data points will be evaluated once characterization of potential Building 52 outfalls is complete.
NJ	Cluster	PDSB-25 SB-098	Existing data points associated with this area completed as a cluster of existing data points. Due to the low concentration of PCBs (relative to the removal criteria) at the existing data point SB-098, an offset of 10 ft may be sufficient to establish excavation limits at this location. Standard offset will be used for PDSB-25 due to a higher concentration at this point.

TABLE 3-1
EXAMPLE SAMPLING RATIONALE FOR OU1 PRE-EXCAVATION DELINEATION PROGRAM

Excavation Area ID PD2-EL-XX	Area Type	Existing Samples in Area	Notes/Exceptions (describe non-standard information/condition)
NK	Linear	PDSB-33	This area will be investigated as a non-standard Linear. Based on the relatively low concentration of PCBs (relative to the removal criteria) and the apparent end of the utility just south of PDSB-33, a 5 foot offset to the north and 15 feet to the south. Due to the presence of Building 52, NK-102 will serve as a documentation sample. Excavation is not expected to be completed within 4 feet of Building 52 wall.
NL	Isolated	PDSS-02 SB-102	This area known to be in the vicinity of a sump. Therefore, 7.5 ft offsets used for evaluation. Maximum excavation depth is 9 feet as described in the ROD.
NM	Isolated	SB-121	Standard offsets for an Isolated. Maximum excavation depth is 9 feet as described in the ROD.
NN	Cluster	PDSB-34 SB-154	Standard 15 foot offsets for a cluster Maximum excavation depth is 9 feet as described in the ROD.
NO	Isolated	CAM-S0-01	A non standard 7.5 foot offset was chosen due to the presence of low concentration PCBs (relative to the removal criteria).
NP	Isolated	None	Existing data points associated with this area may or may not be associated with subsurface utilities. Offsets from these existing data points will be evaluated once characterization of potential Building 52 outfalls is complete.
NQ	Isolated	None	Investigation borings were not completed in this area. Therefore, the suspected pipe will be located and accessed (if located) to assess the potential for this area being a source area as described in the document.
NR	Isolated	None	Isolated point of a surface exceendance with an existing data point below critieria within 10 feet. Access of drilling equipment may be an obstacle to obtaining a sample every 30 feet. Therefore, the number of samples required to maintain an average of one sample per 30 feet was maintained. Maximum excavation depth is 9 feet as described in the ROD.
WEST			
WA	Cluster	Multiple	Area that includes many existing data points, evaluated for large-scale excavation to 9 ft depth as described in the ROD.
WB	Isolated	SB-123	Standard isolated point offset; maximum excavation depth is 9 feet as described in the ROD.
WC	Isolated(s)	PDSB-22 SB-063	Exceedances for both existing data points are 6 ft or shallower. Maximum excavation depth is 9 feet as described in the ROD Two Isolated excavations combined, share confirmatory sample locations.
WD	Isolated(s)	FL-21	Evaluated using non standard offsets due to the shared boarder of excavation WA and low concentrations in the existing sample point. Maximum excavation depth is 9 feet as described in the ROD.
WE	Cluster	PDSB-30 TB-17	Evaluated using non standard offsets due to the shared boarder of excavation WA and low concentrations in TB-17. WE-105 may serve as a step up sample. Maximum excavation depth is 9 feet as described in the ROD.

NOTES:
TBD - To Be Determined
N/A - Not Applicable



LEGEND:

- PROPOSED INVESTIGATION BORING
- PROPOSED EXCAVATION LIMITS
- PROPERTY LINE
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RIP-RAP
- RESULT LESS THAN CRITERIA
- RESULT GREATER THAN CRITERIA
- LEAD HOTSPOT
- STORM DRAIN/SANITARY
- EXISTING STORM SEWER

ANALYSIS NOT PERFORMED IN EXISTING SAMPLE
HORI□ON SAMPLE
A1 □ ANALY□E RESAMPLE FIRST
A2 □ ANALY□E RESAMPLE BASED ON RESULTS OF A1, ETC.
ALL RESAMPLES ARE -0XX
ALL OFFSETS ARE -1XX, STEPOUTS WILL BE -2XX
X □ SAMPLE NOT PLANNED AT THIS INTERVAL
EXPECTED BOTTOM OF EXCAVATION DEPTH BASED ON EXISTING DATA
A BLANK CELL INDICATES THAT A SAMPLE MAY BE COLLECTED WITHIN THIS INTERVAL.
EXPECTED SIDEWALL BOTTOM INTERVAL□ IF □10PPM IN OFFSET, REPRESENTS COMPLIANT SIDEWALL SAMPLE

PROGRAM TYPE (PRE-DESIGN INVESTIGATION - PHASE 2
EXCAVATION IDENTIFICATION (SA□SOUTH EXCAVATION LOCATION "A")
PD2-EL-SA-101
SAMPLE TYPE (ENVIRONMENTAL LAND)
BORING LOCATION NUMBER

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS. THE MEAN HIGH LINE IS ESTIMATED AT ELEVATION +2.2 FEET. MEAN LOW IS SHOWN AT ELEVATION -1.0 FEET, BUT IS UNDERSTOOD TO BE AT APPROXIMATELY ELEVATION -2.0 FEET.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.
5. BORING LOCATIONS ON SHORE SURVEYED BY BOSWELL ENGINEERING IN SEPTEMBER 2007 □ APRIL 2008.
6. EXISTING DATA BASED ON 2008 MODIFIED SITE CONCEPTUAL MODEL.

W S N E

0 80 160 240 320
SCALE IN FEET

HALEY & ALDRICH

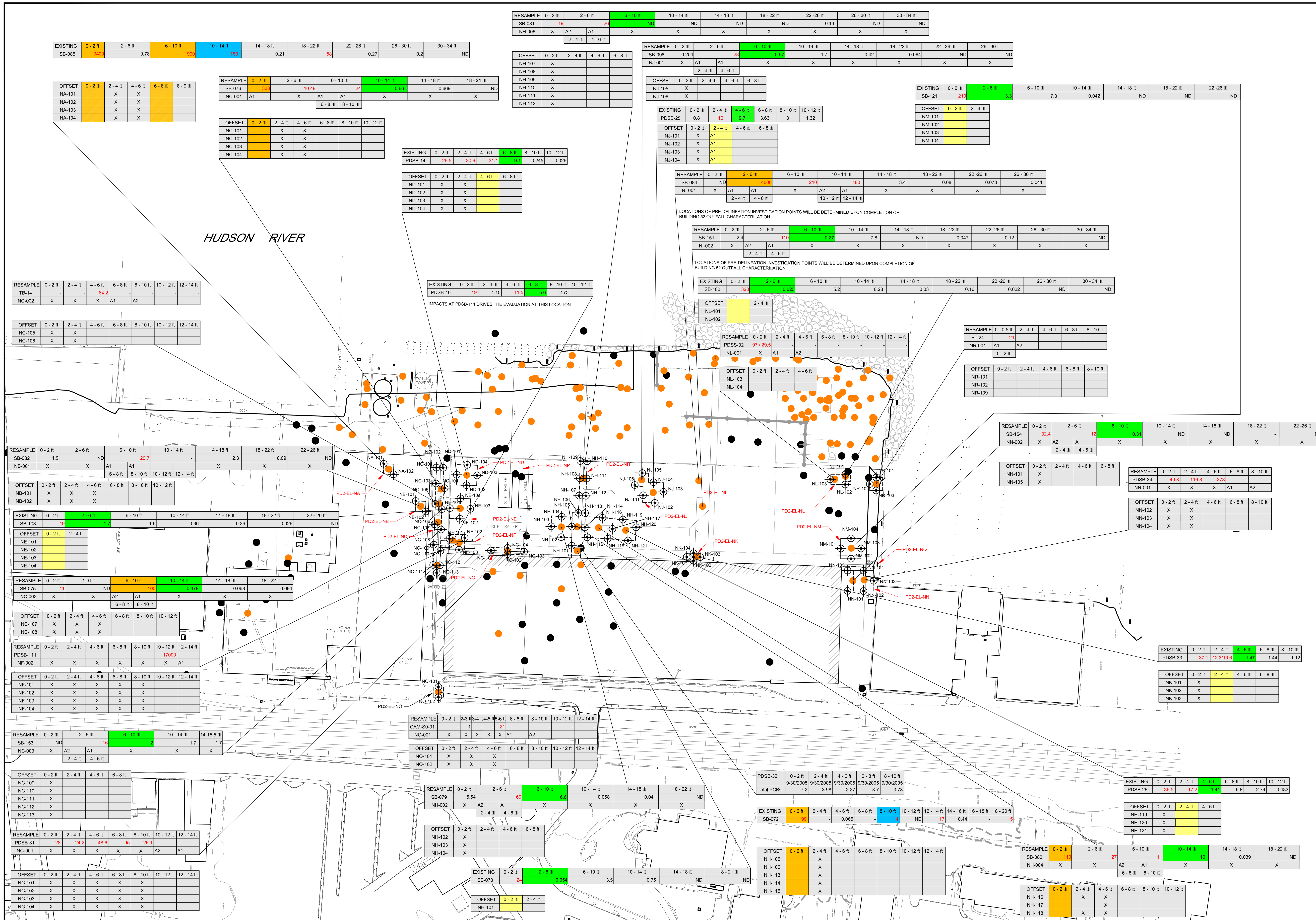
NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

PROPOSED EXPLORATIONS
(SOUTH AREA)

SCALE: AS SHOWN
MAY 2013

FIGURE 3-1

C:\USERS\KMA\DESKTOP\DESKTOP FILES\28612-250-0011 DATABOX PROP BORINGS 2013_R11 052313.DWG



LEGEND:

- PROPOSED INVESTIGATION BORING
- PROPOSED EXCAVATION LIMITS
- PROPERTY LINE
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RIP-RAP
- RESULT LESS THAN CRITERIA
- RESULT GREATER THAN CRITERIA
- STORM DRAIN/SANITARY
- EXISTING STORM SEWER

EXCAVATION BOTTOM MAY BE ESTABLISHED AT 9[illegible]

RESAMPLE	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	10 - 12 ft	12 - 14 ft
PDSB-109	-	536	52	-	-	-	-
SN-001	X	X	X	A1	A1		

EXISTING	0-1ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 9 ft	9 - 11 ft	11 - 13 ft
EE-04	-	-	-	21	ND	ND	ND

OFFSET	0-1ft	1 - 3 ft	3 - 5 ft	5 - 7 ft	7 - 9 ft
SG-104	X	X	X		

ANALYSIS NOT PERFORMED IN EXISTING SAMPLE

HORIZON SAMPLE

A1 = ANALYZE RESAMPLE FIRST
A2 = ANALYZE RESAMPLE BASED ON RESULTS OF A1, ETC.

ALL RESAMPLES ARE -0XX

ALL OFFSETS ARE -1XX, STEPOUTS WILL BE -2XX

X = SAMPLE NOT PLANNED AT THIS INTERVAL

EXPECTED BOTTOM OF EXCAVATION DEPTH BASED ON EXISTING DATA

A BLANK CELL INDICATES THAT A SAMPLE MAY BE COLLECTED WITHIN THIS INTERVAL.

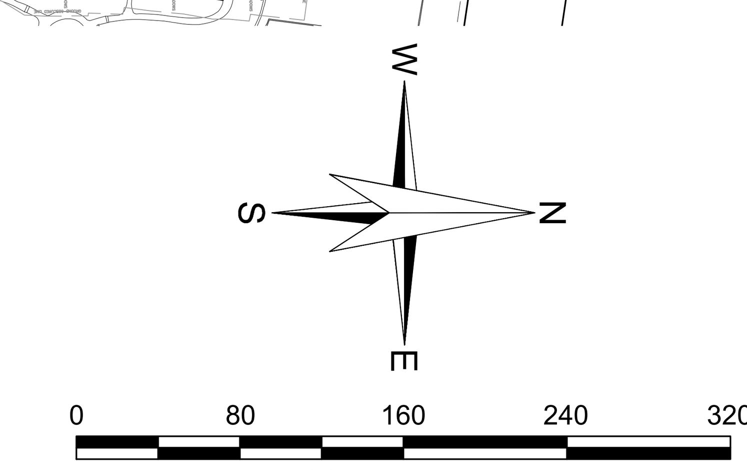
EXPECTED SIDEWALL BOTTOM INTERVAL[illegible] IF [illegible]10PPM IN OFFSET, REPRESENTS COMPLIANT SIDEWALL SAMPLE

PD2-EL-NA-101

- PROGRAM TYPE (PRE-DESIGN INVESTIGATION - PHASE 2
- SAMPLE TYPE (ENVIRONMENTAL LAND)
- EXCAVATION IDENTIFICATION (NA[illegible]NORTH EXCAVATION LOCATION "A")
- BORING LOCATION NUMBER

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS. THE MEAN HIGH LINE IS ESTIMATED AT ELEVATION +2.2 FEET. MEAN LOW IS SHOWN AT ELEVATION -1.0 FEET, BUT IS UNDERSTOOD TO BE AT APPROXIMATELY ELEVATION -2.0 FEET.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.
5. BORING LOCATIONS ON SHORE SURVEYED BY BOSWELL ENGINEERING IN SEPTEMBER 2007 [illegible] APRIL 2008.
6. EXISTING DATA BASED ON 2008 MODIFIED SITE CONCEPTUAL MODEL.



HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

PROPOSED EXPLORATIONS (NORTH AREA)

SCALE: AS SHOWN
MAY 2013

FIGURE 3-2

C:\USERS\KMA\DESKTOP\DESKTOP FILES\28612-250-0011 DATABOX PROP BORINGS 2013_R11 052313.DWG

OFFSET SAMPLING REGIME FOR EXCAVATION WA

Offset ID	0-2	2-4	4-6	6-8	8-10	Reference Sample for Offset
WA-101	X	X	X	resample existing		SB-059
WA-102	X	X	X	resample existing		
WA-103	X	X	X	X	A1	PDSB-11
WA-104	X	X	X	X	A1	
WA-105	X	X	X	X	A1	TB-09
WA-106	X	X	X	X	A1	
WA-107	X	X	X	X	A1	PDSB-07
WA-108	X	X	X	X	A1	PDSB-08
WA-109	X	X	X	X	A1	PDSB-12
WA-110	X	X	X	X	A1	
WA-111	X	X	X	X	A1	
WA-112	X	X	X	X	A1	
WA-113	A1	X	X	X	A1	SB-116
WA-114	X	X	X	X	A1	TB-10
WA-115	X	X	X	X	A1	
WA-116	X	X	X	X	A1	
WA-117	A1	X	X	X	A1	PDSB-10
WA-118	A1	X	X	X	A1	
WA-119	A1	resample existing		X	X	SB-115
WA-120	A1	X	X	X	A1	PDSB-15,
WA-121	A1	X	X	X	A1	EE-15
WA-122	X	X	X	X	A1	PDSB-17
WA-123	X	A1	X	X	A1	SB-035
WA-124	X	A1	X	X	A1	PDSB-20
WA-125	X	A1	X	X	A1	
WA-126	X	A1	X	X	A1	
WA-127	X	A1	X	X	A1	PDSB-21
WA-128	X	A1	A1	A1	A1	
WA-129	A1	X	X	X	A1	SB-062
WA-130	X	A1	X	X	A1	PDSB-18,
WA-131	X	A1	X	X	A1	SB-064
WA-132	X	A1	X	X	A1	SB-066
WA-133	X	A1	X	X	A1	PDSB-23
WA-134	X	A1	X	X	A1	
WA-135	X	A1	X	X	A1	
WA-136	X	X	X	X	A1	PDSB-24
WA-137	X	X	X	X	A1	SB-067
WA-138	X	X	X	X	A1	
WA-139	X	X	X	X	A1	
WA-140	X	X	X	X	A1	DB-30
WA-141	X	X	X	X	A1	DB-29
WA-142	X	X	X	X	A1	
WA-143	X	X	X	X	A1	DB-28
WA-144	X	X	X	X	A1	
WA-145	X	X	X	X	A1	DB-20
WA-146	X	X	X	X	A1	
WA-147	X	X	X	X	A1	DB-22
WA-148	X	X	X	X	A1	
WA-149	X	X	X	A1	A1	PDSB-28
WA-150	X	X	X	X	A1	HA-116
WA-151	X	X	X	X	A1	
WA-152	X	X	X	A1	A1	PDSB-29,
WA-153	X	X	X	X	A1	TB-17
WA-154	X	X	A1	X	A1	HA-115,
WA-155	X	X	A1	X	A1	PDSB-30

EXISTING SAMPLE DATA REFERENCED FOR OFFSET LOCATIONS CAN BE FOUND IN ATTACHMENT 1 OF APPENDIX 3 OF THE RDWP.

EXISTING	0 - 2 ft	2 - 6 ft	6 - 10 ft	10 - 14 ft	14 - 18 ft	18 - 22 ft	22 - 26 ft	26 - 30 ft	30 - 34 ft
SB-123	1300	0.27	0.054	0.036	ND	ND	ND	0.4	ND

OFFSET	0 - 2 ft	2 - 4 ft	4 - 6 ft
WB-101	A1		
WB-102	A1		
WB-103	A1		
WB-104	A1		

RESAMPLE	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	10 - 12 ft
PDSB-22	-	50	-	5.3	-	-
WC-002	X	X	A1	X	X	X

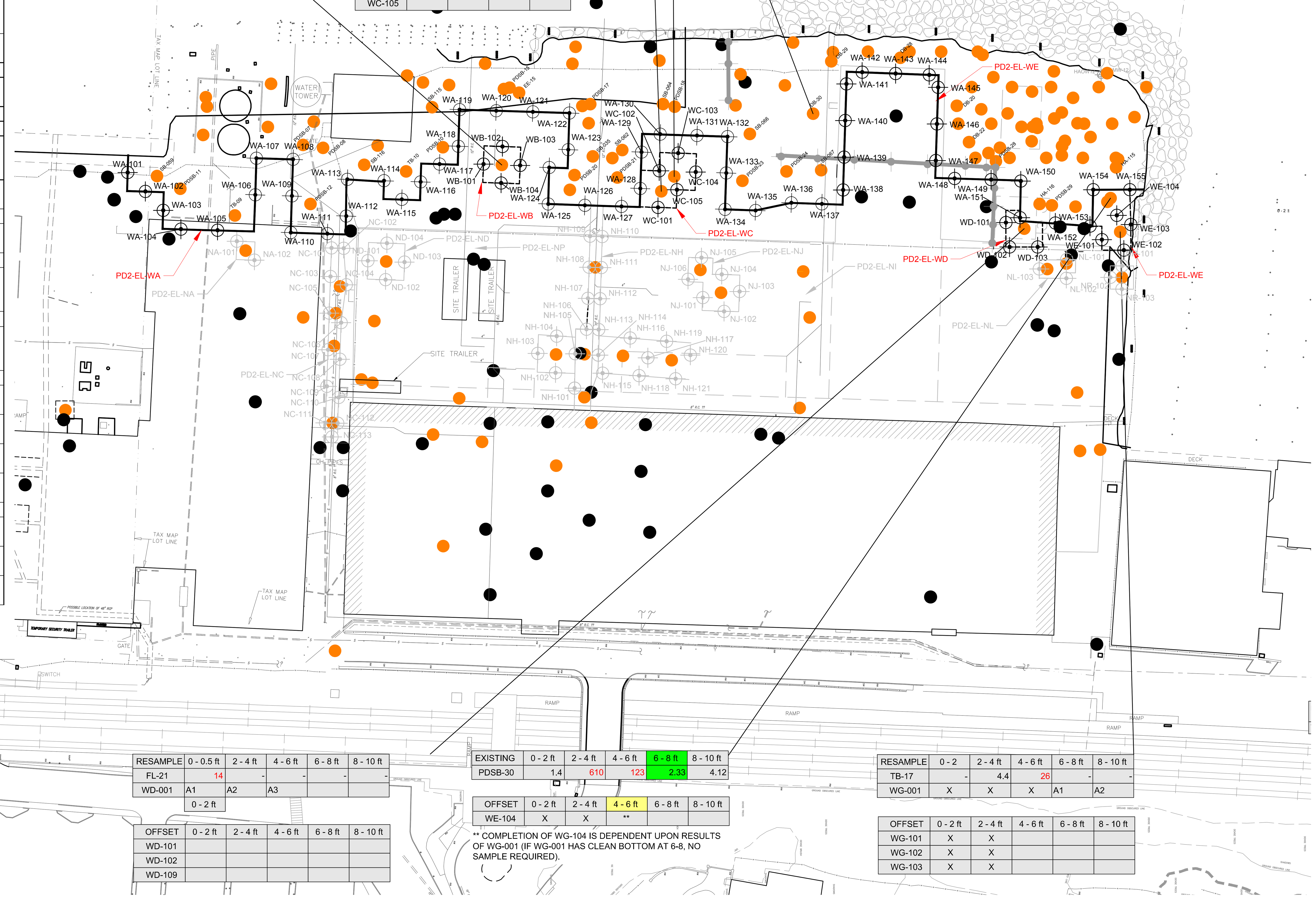
OFFSET	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft
WC-103	X				
WC-104	X				

RESAMPLE	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	10 - 12 ft
SB-063	100	-	8.5	-	8.9	-
WC-001	X	A1	X	X	X	X

OFFSET	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft
WC-101				
WC-102				
WC-105				

RESAMPLE	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	10 - 12 ft	12 - 14 ft	14 - 16 ft	16 - 18 ft	18 - 20 ft	20 - 22 ft
DB-30	7.3	-	92	-	110	0.31	-	ND	0.049	ND	0.043

RIVER



RESAMPLE	0 - 0.5 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft
FL-21	14	-	-	-	-
WD-001	A1	A2	A3		
	0 - 2 ft				

OFFSET	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft
WD-101					
WD-102					
WD-109					

EXISTING	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft
PDSB-30	1.4	610	123	2.33	4.12

OFFSET	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft
WE-104	X	X	**		

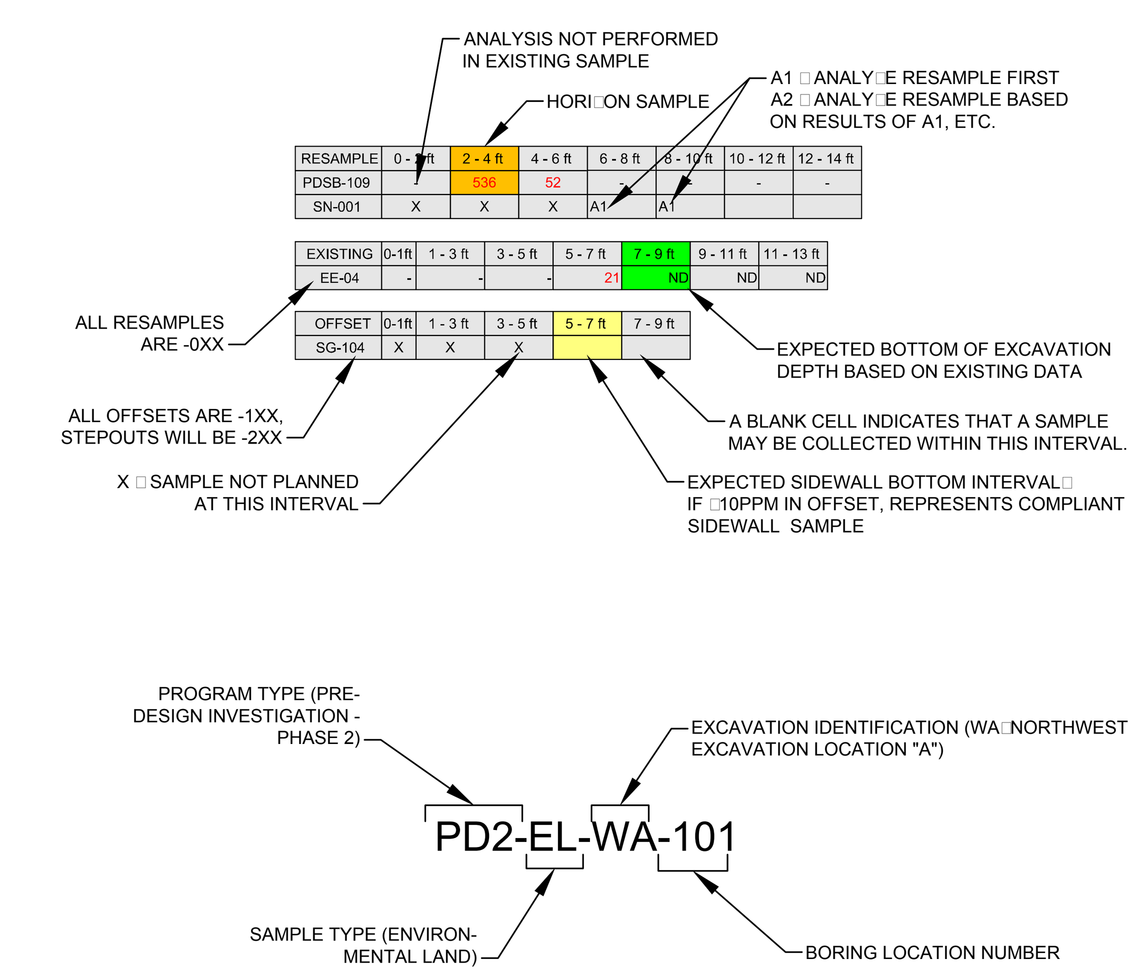
** COMPLETION OF WG-104 IS DEPENDENT UPON RESULTS OF WG-001 (IF WG-001 HAS CLEAN BOTTOM AT 6-8, NO SAMPLE REQUIRED).

RESAMPLE	0 - 2	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft
TB-17	-	4.4	26	-	-
WG-001	X	X	X	A1	A2

OFFSET	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft
WG-101	X	X			
WG-102	X	X			
WG-103	X	X			

LEGEND:

- PROPOSED INVESTIGATION BORING
- PROPOSED EXCAVATION LIMITS
- PROPERTY LINE
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RIP-RAP
- RESULT LESS THAN CRITERIA
- RESULT GREATER THAN CRITERIA
- STORM DRAIN/SANITARY
- EXISTING STORM SEWER
- DEADMAN AND EXTENSION ALIGNMENT AND PROBES (SEE APPENDIX 4)



NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS. THE MEAN HIGH LINE IS ESTIMATED AT ELEVATION +2.2 FEET. MEAN LOW IS SHOWN AT ELEVATION -1.0 FEET, BUT IS UNDERSTOOD TO BE AT APPROXIMATELY ELEVATION -2.0 FEET.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.
5. BORING LOCATIONS ON SHORE SURVEYED BY BOSWELL ENGINEERING IN SEPTEMBER 2007 □ APRIL 2008.
6. EXISTING DATA BASED ON 2008 MODIFIED SITE CONCEPTUAL MODEL.

W S N E

0 60 120 180 240
SCALE IN FEET

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

PROPOSED BORINGS (NORTHWEST AREA)

SCALE: AS SHOWN
MAY 2013

FIGURE 3-3

C:\USERS\KMA\DESKTOP\DESKTOP FILES\28612-250-0011 DATABOX PROP BORINGS 2013_R11 052213.DWG

ATTACHMENT 1

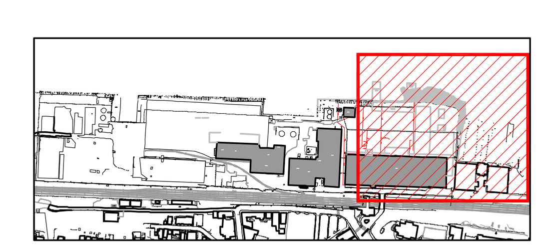
2008 Modified CSM Figures

LEGEND:

- PROPERTY LINE
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RIP-RAP
- RESULT <1 MG/KG
- RESULT >1 AND <=10 MG/KG
- RESULT >10 AND <=50 MG/KG
- RESULT >50 MG/KG
- STORM DRAIN/SANITARY
- EXISTING STORM SEWER
- UNKNOWN

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS. THE MEAN HIGH LINE IS ESTIMATED AT ELEVATION +2.2 FEET. MEAN LOW IS SHOWN AT ELEVATION -1.0 FEET, BUT IS UNDERSTOOD TO BE AT APPROXIMATELY ELEVATION -2.0 FEET.
4. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.
5. BORING LOCATIONS ON SHORE SURVEYED BY BOSWELL ENGINEERING IN SEPTEMBER 2007 & APRIL 2008.
6. MAXIMUM RESULT SHOWN IN EACH DEPTH INTERVAL.
7. RESULTS IN DATABOXES SCREENED AGAINST SITE-SPECIFIC CRITERIA: < 1MG/KG, >1 AND <=10 MG/KG, >10 MG/KG AND <=50 MG/KG, AND >50 MG/KG.
8. ALL RESULTS SHOWN IN MG/KG.
9. SAMPLES COLLECTED POST 2005 INCLUDE AROCLOR 1262 AND 1268. SEE SECTION 6.1.1 IN MODIFIED CONCEPTUAL SITE MODEL REPORT FOR MORE INFORMATION.



SITE KEY: NTS

W / N / E / S

0 60 120 180 240

SCALE IN FEET

HALEY & ALDRICH

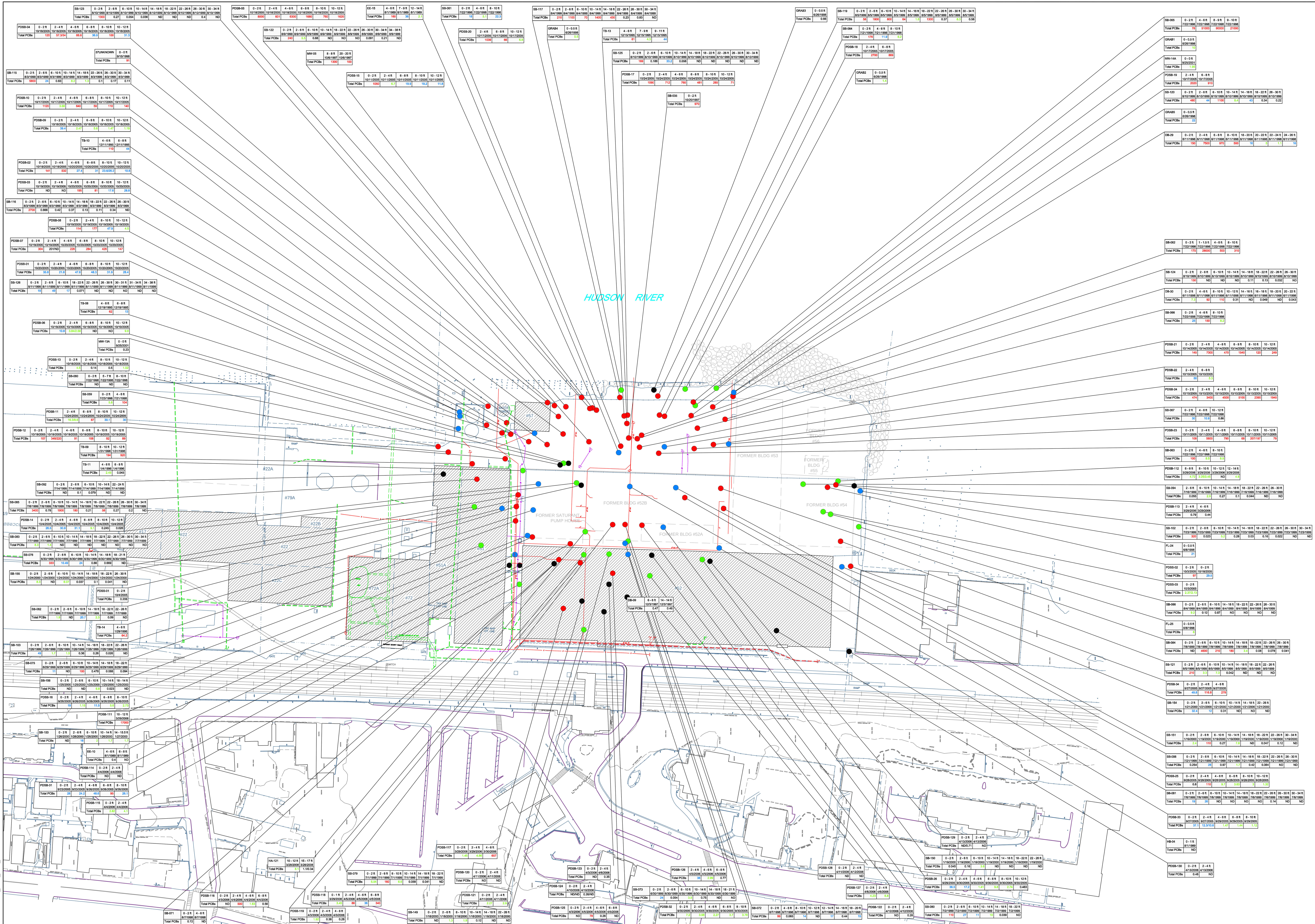
NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

TOTAL PCB CONCENTRATIONS IN SOIL (NORTHWEST CORNER)

SCALE: AS SHOWN
AUGUST 2008

FIGURE 7A

G:\28612_HASTINGS\GLOBAL\CAD\28612-DATABOX_SOIL_PCB_R2.DWG



LEGEND:

- PROPERTY LINE
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RIP-RAP
- RESULT <1 MG/KG
- RESULT >1 AND <=10 MG/KG
- RESULT >10 AND <=50 MG/KG
- RESULT >50 MG/KG
- STORM DRAIN/SANITARY
- EXISTING STORM SEWER
- UNKNOWN

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS. THE MEAN HIGH LINE IS ESTIMATED AT ELEVATION +2.2 FEET. MEAN LOW IS SHOWN AT ELEVATION -1.0 FEET, BUT IS UNDERSTOOD TO BE AT APPROXIMATELY ELEVATION -2.0 FEET.
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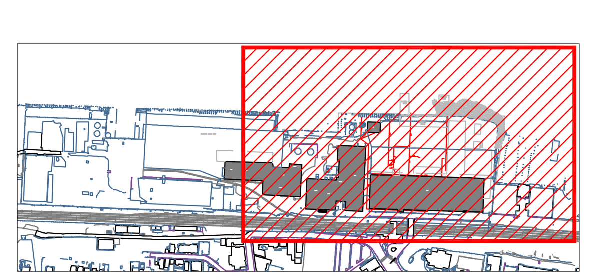
5. BORING LOCATIONS ON SHORE SURVEYED BY BOSWELL ENGINEERING IN SEPTEMBER 2007 & APRIL 2008.
6. MAXIMUM RESULT SHOWN IN EACH DEPTH INTERVAL.
7. RESULTS IN DATABOXES SCREENED AGAINST SITE-SPECIFIC CRITERIA: < 1MG/KG, >1 AND <=10 MG/KG, >10 MG/KG AND <=50 MG/KG, AND >50 MG/KG.
8. ALL RESULTS SHOWN IN MG/KG.
9. SAMPLES COLLECTED POST 2005 INCLUDE AROCLOR 1262 AND 1268. SEE SECTION 6.1.1 IN MODIFIED CONCEPTUAL SITE MODEL REPORT FOR MORE INFORMATION.



SITE KEY: NTS

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

TOTAL PCB CONCENTRATIONS IN SOIL (NORTH REMAINDER AREA)

SCALE: AS SHOWN
AUGUST 2008

FIGURE 7B

G:\28612_HASTINGS\GLOBAL\CAD\28612-DATABOX_SOIL_PCB_R2.DWG

LEGEND:

- PROPERTY LINE
- EXISTING STRUCTURES
- FORMER STRUCTURES
- FENCE
- RIP-RAP
- RESULT <1 MG/KG
- RESULT >1 AND <=10 MG/KG
- RESULT >10 AND <=50 MG/KG
- RESULT >50 MG/KG
- STORM DRAIN/SANITARY
- EXISTING STORM SEWER
- UNKNOWN

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. HISTORICAL SURVEY INFORMATION PROVIDED BY PARSONS IN JULY 2005.
3. MEAN HIGH AND MEAN LOW WATER ARE EL. +2.2 AND EL. -2.0, BASED ON HISTORICAL SITE REPORTS. THE MEAN HIGH LINE IS ESTIMATED AT ELEVATION +2.2 FEET. MEAN LOW IS SHOWN AT ELEVATION -1.0 FEET, BUT IS UNDERSTOOD TO BE AT APPROXIMATELY ELEVATION -2.0 FEET.
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5. BORING LOCATIONS ON SHORE SURVEYED BY BOSWELL ENGINEERING IN SEPTEMBER 2007 & APRIL 2008.
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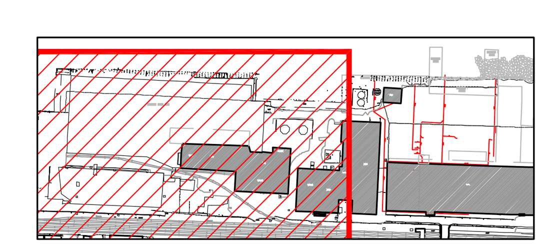
7. RESULTS IN DATABOXES SCREENED AGAINST SITE-SPECIFIC CRITERIA: < 1MG/KG, >1 AND <=10 MG/KG, >10 MG/KG AND <=50 MG/KG, AND >50 MG/KG.
8. ALL RESULTS SHOWN IN MG/KG.
9. SAMPLES COLLECTED POST 2005 INCLUDE AROCLOR 1262 AND 1268. SEE SECTION 6.1.1 IN MODIFIED CONCEPTUAL SITE MODEL REPORT FOR MORE INFORMATION.



W
S N
E

0 60 120 180 240

SCALE IN FEET

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

TOTAL PCB CONCENTRATIONS IN SOIL (SOUTH AREA)

SCALE: AS SHOWN
AUGUST 2008

FIGURE 7C

APPENDIX 4

Extension Alignment Investigation Plan

APPENDIX 4

EXTENSION ALIGNMENT INVESTIGATION PLAN

1. INTRODUCTION

This plan describes PCB Material (PCBM) and riprap probes. This task is part of the overall pre-design investigation (PDI) that will be completed at the Former Anaconda Wire & Cable Company site (Site), NYSDEC Site # 3-60-022, located on the east shore of the Hudson River at 1 River Street, Hastings-on-Hudson, New York.

2. BACKGROUND

Design and construction of the bulkhead extension in the Northwest Corner described in the OU-2 ROD requires confirmation of the absence of PCB Material as DNAPL or Semi-solid material and the absence of major obstructions (e.g. riprap) along the alignment for the new bulkhead extension. Previous investigations have identified the presence of riprap and PCB Material in the area but further delineation is required for design.

3. SCOPE OF WORK

3.1 Purpose and Scope

The purpose of the PCBM and riprap probes is to evaluate the presence of both PCBM and obstructions along the alignments of the proposed bulkhead extension wall and deadman. These factors are important for several reasons:

- To provide the required lateral resistance, the deadman and bulkhead extension wall must be driven to the Basal Sand. It is important to confirm that semi-solid or liquid PCBM do not exist along the alignment, since it could be dragged down to the Basal Sand during construction of the wall.

- To provide sufficient containment, the extension wall must be installed outboard of liquid PCBM.

- To properly install the sheetpile for the wall, it must be located outboard of large or significant thickness of obstructions (such as riprap) that could prevent proper installation.

In the current design concept, the bulkhead extension wall and deadman are anticipated to consist of a king pile wall with 66-in. diameter pipe piles at 10-foot centers, with sheetpiles between.

A phased approach of probes is planned in the vicinity of the planned extension wall and deadman, with the actual number and locations of probes to be determined as the work progresses, depending on conditions encountered. The proposed probe procedure utilizes methods that have been successfully employed at the site during previous investigations, which include the adhesion testing performed in 2008 to observe presence of PCBM, and the riprap probes performed in 2010 to initially evaluate the extent and thickness of riprap.

3.2 PCBM Adhesion Testing

In general, samples will be obtained from the probes and will be evaluated to determine visual evidence of PCBM. A procedure to visually observe PCBM in sediment samples, called adhesion testing, was previously performed at the site in 2008.

Initial physical screening of the PCBM indicated that the material readily adheres to steel. As such, stainless steel laboratory spatulas were used in 2008 to examine each sample for presence and adhesion of PCBM. A similar procedure will be used for this task of the PDI. A steel spatula will be probed into the soil along the length of each sample, and visual observations will be made of whether PCBM is visible in the sample, or visible adhering to the spatula.

If trace PCBM is suspected after the adhesion testing, pull testing will also be performed, in which a small amount of soil from the sample is collected and compacted, and then pulled apart to identify if string-like material can be observed.

Samples will be visually inspected, probed with the stainless steel spatula, and logged for PCBM observations and soil stratigraphy. Samples where PCBM is positively identified will be photographically recorded. After observation, samples will be drummed for disposal. Samples will not be retained.

3.3 Off-shore Probes

3.3.1 Off-shore Probe Procedure

Off-shore probes will be advanced using rotary wash drilling techniques, using a drilling rig mounted on a barge. Casing will be advanced through the sediment by pushing using the weight of the rig. Split spoon samples will also be advanced in front of the casing, and samples will be examined for PCBM as discussed in the preceding section. If no recovery is obtained, observations will be made to evaluate whether PCBM is visibly adhered to the split spoon sampler. The split spoons will be advanced either to the top of the Marine Silt, or until hammer blowcounts indicate the potential presence of riprap.

If assumed riprap is encountered, the rollerbit will be inserted into the hole and spun to confirm refusal. Observations will be made of the thickness and likely size of the riprap (as inferred based on drilling action). In the intervals where the roller bit is advanced, no split spoon samples will be obtained (and no PCBM observations of samples will be made) since the materials being drilled (cobbles and boulders) exceed the sampler size. If the roller bit cannot be advanced through the riprap, the location will be terminated due to rollerbit refusal and the barge will be moved to the next probe location.

Split spoon samples will be obtained from mudline to 5 feet below the top of the Marine Silt (except for the obstruction zones or in locations where roller bit refusal is encountered). The top of Marine Silt will be estimated based on contour plans that have been prepared from borings that have previously been drilled in the northwest area.

After each probe, the casing and rollerbit will be examined for any evidence of PCB Material and decontaminated if required. Additionally, residual sediment will be removed from the casing and rollerbit.

3.3.2 Off-shore Probe Sequence

The general sequence of the work is anticipated to be as follows:

Probes will be initiated on the alignment shown as Round 1 on Figure 4-1. Generally, the Round 1 alignment is offset 13 feet from locations where PCBM has been observed in the past. The 13 foot offset amount is chosen based on a desired 10 foot (approximate) buffer between the edge of the wall and a positive PCBM observation, plus the 3 foot (approximate) distance from edge of wall to centerline of wall (based on the currently anticipated 66-in. diameter pipe piles). Some isolated locations of "inferred potential PCB material" (i.e. based on an interpretation of historical observations prior to the adhesion testing program) are located in shallow sediment which would be removed prior to installation of the bulkhead and therefore do not constrain the bulkhead alignment.

- Round 1 - Perform probes generally at 30-foot centers along the line shown as Round 1 on Figure 4-1. At locations adjacent to an existing positive PCBM observation, the probe spacing will be decreased to 15 feet. For each probe, obtain split-spoon samples at 2-foot intervals to a depth corresponding to 5 feet below the estimated top of the Marine Silt. Perform adhesion testing on each split spoon sample. If obstructions are encountered when pushing the split spoon, the roller bit will be advanced through the obstruction to the extent possible, to obtain information on thickness and size of riprap. (Again, note that split spoon samples for PCB observation will not be obtained within the obstruction/rollerbit zones, since the obstructions will exceed the size of the sampler). If no PCBM is observed in any sample taken from Round 1, and if no significant riprap thickness is encountered, the program will be complete. For locations where PCBM is observed in Round 1 samples, and/or if significant riprap thickness is encountered, continue to Round 2 at those locations.

- Round 2 – Perform probes 13 feet outboard from Round 1, in locations where positive Round 1 PCBM observations are identified, and/or riprap is encountered. Spacing of Round 2 probes will be determined based on conditions encountered in Round 1. Adhesion testing and riprap probing will be performed as described above. If no PCBM is observed in any sample taken from Round 2 and if no riprap is encountered, the program will be complete. For locations where PCBM or riprap are observed in Round 2 samples, continue to Round 3 at those locations.

  Note that riprap refusal is not expected on the Round 2 alignment, based on information obtained from the 2010 riprap probes.

- Round 3 – Perform probes 13 feet outboard from Round 2, in locations where positive Round 2 PCBM observations are identified, and/or riprap refusal is encountered. Spacing of Round 3 probes will be determined based on conditions encountered in Round 2. Adhesion testing and riprap probing will be performed as described above.

Up to approximately 27 probes are expected to be completed for Round 1. See Figure 4-1 for approximate Round 1, 2, and 3 alignments and approximate Round 1 probing locations.

Round 2 and Round 3 lines are shown for reference purposes only and probes will not necessarily be performed along these lines. Individual probe locations along Round 2 or Round 3 will be field-determined based on the preceding Round 1 (or 2) results, as described above, and will be performed only in locations where adjacent Round 1 (or 2) probes encounter PCBM and/or obstructions.

Also, the Round 1 probe number and sequence is subject to change based on initial probe results. Round 1 probes will be initiated in the vicinity of locations where PCBM observations are mostly likely to occur, adjacent to existing positive PCBM observations (such as HA-217, HA-P12, and HA-204). Subsequent Round 1 locations may be adjusted or eliminated based on these results.

For the probes planned in the Old Marina area, some of the existing piles and dock structures may be removed prior to the work, to allow access for the drilling barge. The Round 1 line shown adjacent to the Old Marina is approximate and subject to change based on access restrictions for the drilling barge.

3.4 Probes along North Property Line

The purpose of the probes planned to be drilled adjacent to the north property line ("North Property Line Probes" on Figure 4-1) is to determine presence or absence of PCBM and riprap, as discussed above, with the added objective of determining whether the wall alignment can be moved south to coincide with the property line along the Old Marina. The current alignment shown in the RFS is north of the property line.

Due to the sloped shoreline and tidal conditions, a drill rig cannot physically be positioned to install vertical borings at the property line. Therefore, the drill rig will be positioned on-shore as near as possible to the property line, and an angled boring will be completed to evaluate conditions at the property line. The boring angle will be adjusted to avoid penetrating the Fill / Marine Silt interface at the former wooden bulkhead that may exist along the property line, as identified during previous borings.

Most of the property line probes will be spaced 30 feet apart, similar to the probes described previously, except for the area immediately adjacent to the borings that have encountered liquid PCBM in the past (HA-114, HAOW12, HARW-4). In the four probes nearest these borings, the spacing will be reduced to 15 feet.

The property line probes will be advanced using either mini-sonic or rotary wash drilling techniques, and the riprap procedures described above will also be used (the rollerbit will be spun through intervals of suspected riprap, based on drilling action and/or hammer blows). Samples will be obtained from ground surface to 5 feet below the top of the Marine Silt.

3.5 Additional On-shore Probes

Two more areas of on-shore probes will also be drilled, and are shown on Figure 4-1:

- Deadman: Due to the fact that the deadman will be required to penetrate into the Basal Sand, a line of PCBM probes will also be advanced along the approximate deadman alignment.

- Extension wall continuation: A continuation of the bulkhead extension wall is required at the transition between the higher elevation upland created by filling behind the wall, versus the lower elevation sloped shore just south of the northwest extension area. This continuation of the bulkhead extension wall may also need to be driven to the Basal Sand.

The on-shore probes will be advanced using sonic drilling techniques. Soil samples will be extracted in 5 or 10 foot long sleeves from ground surface to 5 feet below the top of the Marine Silt. As with the off-shore probes, the top of Marine Silt will be estimated based on contour plans that have been prepared based on the borings that have previously been drilled in the northwest area.

After each probe, the drill tooling will be examined for any evidence of PCB Material and decontaminated if required. Additionally, residual soil will be removed from the drill tooling.

A Round 1, 2, and 3 phased approach will be used, and each will be offset by 13 feet, similar to the approach described above for the off-shore probes.

3.6 Laboratory Testing

No laboratory testing is planned for this task. Presence of PCBM will be determined based on visual observation only.

3.7 Relevant Field Operating Procedures

Field investigations will be performed in general accordance with the following Operating Procedures (OPs). Refer to Appendix A.

OP1002 – Drilling Safety
OP1008 – Operations Over, Near, or On Water
OP2000 – Monitoring Field Explorations
OP2001 – Identification and Description of Soils Using Visual-Manual Methods
OP2005 – Test Borings, Sampling, Standard Penetration Testing and Borehole Abandonment

4. QUALITY ASSURANCE

Appendix A of the RDWP provides a Quality Assurance Project Plan (QAPP).

5. SUBMITTALS

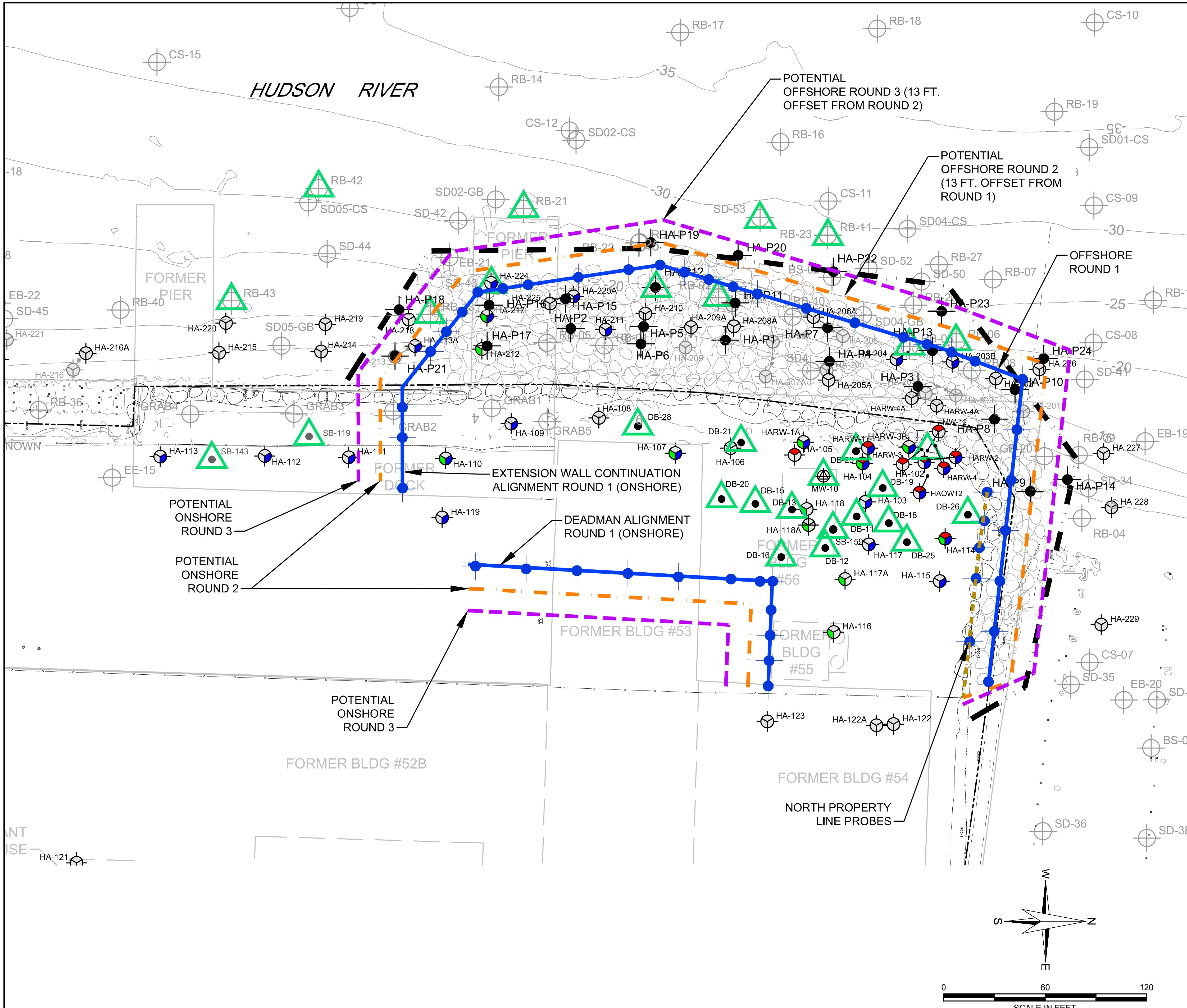
Applicable data will be included in the PDI Data Summary Report.

6. HEALTH AND SAFETY

Health and safety requirements applicable to all persons entering the site or involved in field activities are described in the Site-specific Health Safety Security and Environmental Plan (HSSEP), these documents will be available for use on Site prior to the commencement of work.

7. ATTACHMENTS

Figure 4-1 Proposed Exploration Location Plan, PCBM/Riprap Probes



LEGEND:

- EXISTING STRUCTURES
- PROPOSED NORTHWEST EXTENSION WALL ALIGNMENT SHOWN IN RFS
- PROPERTY BOUNDARY
- RIP-RAP
- EXPLORATION LOCATION TO MARINE SILT INTERFACE
- LEADER INDICATING ACTUAL EXPLORATION LOCATION
- EXPLORATION LOCATION WHERE MARINE SILT WAS NOT ENCOUNTERED DUE TO REFUSAL
- HISTORICAL SAMPLE LOCATION (DEPTH VARIES)
- HISTORICAL SAMPLE LOCATION (DEPTH VARIES)
- 2010 RIP-RAP INVESTIGATION PROBE
- APPROXIMATE / CONCEPTUAL LOCATION OF PROPOSED PCB / RIPRAP PROBE

SAMPLE LEGEND:

LIQUID PCB MATERIAL
SEMISOLID PCB MATERIAL
TRACE PCB MATERIAL

- LIQUID PCB MATERIAL OBSERVED
- SEMISOLID PCB MATERIAL OBSERVED
- TRACE PCB MATERIAL OBSERVED
- NO PCB MATERIAL OBSERVED
- INFERRED POTENTIAL PCB MATERIAL LOCATION

NOTES:

1. BASE PLAN PROVIDED BY BOSWELL ENGINEERING DRAWING NO. 04-209-MW (01/27/2006).
2. RIP-RAP DESIGNATION IN THE RIVER IS BASED ON INTERPRETATION OF SIDE SCAN SONAR DATA PROVIDED BY AQUASURVEY INC. IN NOVEMBER 2007.
3. THE ROUND 1 LINE IN THE OLD MARINA IS APPROXIMATE AND SUBJECT TO CHANGE BASED ON ACCESS RESTRICTIONS FOR THE DRILLING BARGE.
4. ROUND 2 AND ROUND 3 LINES ARE SHOWN FOR REFERENCE PURPOSES ONLY AND PROBES WILL NOT NECESSARILY BE PERFORMED ALONG THESE LINES. INDIVIDUAL PROBES ALONG ROUND 2 OR ROUND 3 WILL BE PERFORMED ONLY IN LOCATIONS WHERE ADJACENT ROUND 1 PROBES ENCOUNTER PCBM AND/OR OBSTRUCTIONS.
5. THE ROUND 1 PROBE LOCATIONS ARE CONCEPTUAL AND SUBJECT TO CHANGE BASED ON FIELD CONDITIONS AND OBSERVATIONS MADE IN ADJACENT ROUND 1 PROBES AS THE WORK PROGRESSES.

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

PROPOSED LOCATION PLAN
PCBM / RIPRAP PROBES

AS SHOWN
MAY 2013

FIGURE 4-1

APPENDIX 5

Deepwater Investigation Plan

APPENDIX 5

DEEPWATER INVESTIGATION PLAN

1. INTRODUCTION

This plan describes the Deepwater Investigation. This investigation is part of the overall pre-design investigation that will be completed at the Former Anaconda Wire & Cable Company site (Site), NYSDEC Site # 3-60-022, located on the east shore of the Hudson River at 1 River Street, Hastings-on-Hudson, New York.

2. BACKGROUND

The Record of Decision (NYSDEC, 2012) (ROD) for Operable Unit No. 2 (OU-2) requires removing sediment in portions of OU-2 including deepwater areas defined as areas beyond feasible deployment of silt curtain and within the extents defined by OU-2. For the deepwater areas where dredging activities cannot be fully contained, the ROD states:

"Removal of sediment from a targeted area outside the northwest extension area in deeper than 15 feet of water that is defined by PCB concentrations greater than 50 ppm, to maximum depth of 6 feet. During the design, sampling will be performed to determine whether additional areas of PCBs greater than 50 ppm exist. Based upon an evaluation of the significance of the distribution of contaminants and the feasibility of removal, additional areas of sediment may be targeted for dredging."

3. SCOPE OF WORK

The goal of this investigation is to examine deepwater areas where PCBs in excess of 50 mg/kg (ppm) (elevated PCB concentrations) are known or suspected to be present, but where insufficient data exists to confirm the presence of PCB deposits with concentrations greater than 50 mg/kg that may require remediation. This investigation will gather data for making decisions regarding remedial action, and will provide information to delineate dredge areas.

This investigation addresses areas in the proximity of existing exceedances and areas between EB-10 and EB-14. Areas previously identified in the ROD to be dredged are pre-delineated in a separate investigation (see RDWP Appendix 6). The deepwater investigation sediment sampling, which will be conducted within an area located approximately 300 feet off-shore of the Site (approximately 4 acres), will be used to further understand lateral and vertical PCB contamination, within specific deepwater areas.

This investigation is comprised of four tasks as described below. Additional details are provided in Section 3.1.

- **Task 1: Resampling - Resample specific locations with elevated PCB concentrations**
  This task investigates areas in the proximity of specific existing exceedances. Specifically, this task will re-sample areas proximate to three previously sampled deepwater locations where elevated PCB concentrations were detected (EB-10, EB-14, CS-19). Sampling at these locations will be used to 1) confirm the presence of elevated PCB concentrations at each location, 2)

confirm the depths of elevated PCB concentration previously detected, and 3) observe physical characteristics at each location. Refer to Figure 5-1 for proposed sampling locations (VC-101 through VC-103).

- **Task 2: Investigation Unit Sampling - Sample the area between EB-10 and EB-14**
  This task samples areas between EB-10 and EB-14. Sampling at these locations will be used to 1) identify the presence of elevated PCB concentrations at each location, 2) to identify the depths of elevated PCB concentration if present, 3) determine whether additional sampling (i.e. step-out sampling) is necessary, and 4) observe physical characteristics at each location. Sediment samples will be collected in a 160-foot triangulation grid pattern to divide the investigation area into hexagonal Investigation Units. Refer to Figure 5-1 for proposed sampling locations and Investigation Units (VC-104 through VC-108).

- **Task 3: Decision Unit Sampling - Including Step-out Investigation (as needed)**
  Investigation Unit(s) will be divided into smaller hexagonal Decision Units as necessary. Sampling will include locations associated with Task 1 and locations from Task 2 that require additional investigation. Finally, step-out samples will be collected in areas that require additional investigation and would create new Decision Units. This investigation task will further assess the nature and extent of elevated PCB concentrations emerging from Task 2 and will support decisions regarding the need for remedial action. Refer to Figure 5-1 for proposed sampling locations (VC-109 through VC-126) and Decision Units including potential step-out Decision Units.

- **Task 4: Variability of Sediment Concentrations**
  Based on a review of data collected in Tasks 1-3, additional samples may be proposed to assess the variability of the sediment concentrations to better understand if the concentrations are uniform or if exceedances are sporadic. Based on the results from the initial sampling, locations may be selected to help assess the contaminant mass distribution in relevant areas. Three additional cores would be added in close proximity to the location being evaluated, with samples collected at corresponding intervals.

3.1 Sampling Program Design

The sampling program employs a 160-foot triangulation grid for investigation areas and an 80-foot triangulation grid for refinement of extents of contamination. All tasks will be performed during a single field event to the extent feasible. As currently planned, the sampling vessel will remain on site until all locations are completed. Sampling described in Task 1, Task 2 and some of the Task 3 locations associated with historical locations (EB-10, EB-14, CS-19) will all be completed during the first sampling round (26 locations). After analysis and review with the NYSDEC, additional Task 3 samples may be completed (up to 22 or more locations). Task 4 sampling may also be completed as described herein.

This program selected vibracore technology to collect sediment cores for sampling based on previous successful sampling programs at the site and other factors (See Section 3.4). Vibracore, along with ponar grabs for surface samples, will be collected from barge or boat-mounted equipment. The vibracore diameter is anticipated to be 4 inches and may change in the field based on sediment conditions and recovery.

Sediment samples will be collected and submitted for PCB analysis according to requirements and procedures described herein and the pertinent operating procedures. Sample locations will be documented using a survey grade differential GPS with a sub-meter accuracy along with a depth sounder as necessary.

3.1.1 Vertical Distribution of Samples

Considering that previous samples indicated PCB exceedances are predominantly within the top 3 feet of sediment. The following approach will be used to establish vertical sample intervals to delineate PCB concentrations in targeted sediment deposits:

Below is a list of depth intervals and rationale for sampling:

- 0.0-0.5 foot:
  - Consistent with previous sampling programs as the surface sediment sampling interval
  - Represents the zone with highest bioactivity
  - Collected using petit ponar sampler or equivalent
  - Represents the most recently deposited sediments
- 0.5-1 and 1-2 foot:
  - Consistent with the ROD which stated that "The majority of targeted PCB dredging areas identified in the deepwater are within the top two feet. Therefore, the targeted dredging will remove sediments which have the highest levels of PCBs and the greatest potential to migrate and be an ongoing source to the environment."
- 2-3 foot:
  - Depth intervals to better define vertical thickness of impacted sediment, to help provide appropriate dredge limits and to prevent unnecessary over-dredging
- 3-4 foot:
  - Provides information on underlying sediments
- 4-6 and 6-8 foot:
  - Provides additional information (as necessary) to document weather the maximum dredge depth of 6 ft is needed and , if so, what residual concentrations would exist

Note that if the preceding shallower interval is < 50 mg/kg then the deeper interval(s) (>4 foot) would not be analyzed. Concentration levels associated with the deepest analyzed interval will be discussed with the DEC prior to discarding archived deeper samples to determine whether further analysis is warranted.

3.1.2 Spatial Distribution of Samples

As discussed above the sampling program employs a 160-foot triangulation grid for investigation areas and an 80-foot triangulation grid for refinement of extents of contamination. This grid system creates hexagonal areas referred to as Investigation and Decision Units, respectively. Additionally, step-out sampling will be implemented where required to adequately delineate locations where spatial extents are not fully bounded.

This grid system was applied uniformly because the investigation area is not directly adjacent to suspected onshore point sources and the sediment material is uniform across this site. Previous grain size analysis data indicate that sediments are predominantly fine grained material of similar properties and direct observations of surface sediments also support this conclusion.

3.1.3 Task 1: Re-Sampling

This investigation task will consist of re-sampling at the three previously sampled deepwater locations where PCB concentrations were detected above 50 mg/kg within the top 3 feet of sediment (EB-10, EB-14, and CS-19) shown on Figure 5-1. These locations will comprise the three initial Investigation Units.

The table below presents the previous PCB concentration data and associated sample depths:

Previous Sediment Sample Locations and Dates Sampled	Sample Depth Interval (feet)	PCB Concentration (mg/kg)
EB-10 (May 2001)	0-0.5	2.1
	1-2	**97**
	2.3-4	ND
	4-6	ND
EB-14 (May 2001)	0-0.5	ND
	1-2	**260**
	2-4	2.4
	4.5-6.5	ND
	7.5-8.5	ND
	8.5-10.5	0.94
	11-12.5	ND
CS-19 (October 1999)	0-0	ND
	0.5-2	ND
	2-2.7	**380**
	2.7-3.2	**140**

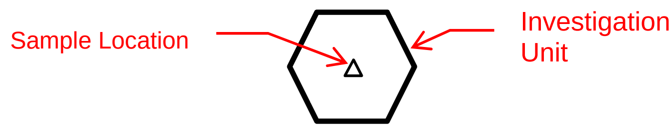
Each of the three sample locations (VC-101 thru VC-103) corresponding to the former EB-10, EB-14, and CS-19 locations will be used to construct an Investigation Unit. Investigation Units are shown and discussed in Section 3.1.4.

In an effort to confirm historic sampling results and evaluate the area proximate to each location, sediment samples will be collected at all depth intervals up to 8 feet (consistent with section 3.1.1). This task will allow comparison of the newly collected data to both the historic data and additional data collected in Task 2. Sediment sampling depths and sediment thickness inconsistencies are anticipated between the historic sample locations and newly proposed confirmatory sampling locations due to sediment deposition since the 1999 and 2001 sampling. This sampling task will provide a more accurate representation of current conditions that will be considered during remedy selection and design.

3.1.4 Task 2: Investigation Unit Sampling

This investigation task will be conducted to further evaluate the potential presence of PCB exceedances as described previously.

The figure below shows how an investigation unit and the corresponding sampling location within that investigation unit are associated. The Investigation Unit size and locations are based on a triangular spacing of approximately 160 feet, each representing approximately 0.5 acres, starting from the former EB-10 Investigation Unit and extending north toward the EB-14 Investigation Unit. A total of 5 locations (VC-104 through VC-108) were identified for consideration and will be located at the center of each additional Investigation Unit (Figure 5-1).



Evaluation of Investigation Unit Data

Results for each new location (VC-104 through VC-108) will be used to characterize each Investigation Unit and to determine whether additional sampling for that Investigation Unit is required.

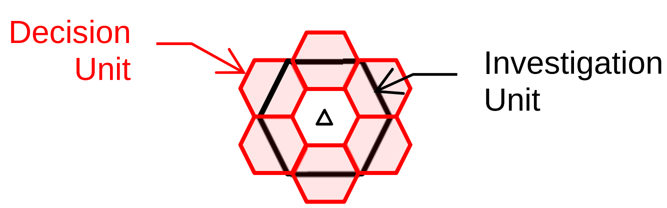
- If Investigation Unit location data indicates all samples are < 50 mg/kg then no further investigation is required (i.e. perimeter decision unit samples are not required).
- If the data does not indicate that all samples are < 50 mg/kg, then additional investigation requirements will be based on consultation with the NYSDEC and will consider:
    - Depth and thickness of PCB exceedances
    - Variability of concentrations
    - Type of environment (erosion or deposition)
    - Concentration levels and thickness of sediments above the PCB exceedances
- Locations that require additional investigation will proceed to Task 3.

3.1.5 Task 3: Decision Unit Sampling

Decision Units are defined by sampling locations placed on an 80-foot triangulation grid. Each decision unit will be representative of approximately 0.13 acres. Decision Units that will be sampled include:

- Locations around the perimeter of EB-10, EB-14 and CS-19 (VC-109 thru VC-126)
- Locations determined to require additional investigation from Task 2
- Locations determined to require additional investigation from Task 3 (step-outs from existing 80-foot grid locations)

The step-out sampling depth intervals and locations will consider Task 1, Task 2 and any previously completed Task 3 sampling results as described previously. The diagram below illustrates Decision Units placed around an Investigation Unit that requires additional investigation. The Sampling location would be at the center of each Decision Unit.



During step-out sampling, Decision Unit samples may be collected and analyzed incrementally.

Evaluation of Decision Unit Data

Results of each decision unit will be evaluated to determine if additional investigation is required.

- If Decision Unit location data indicates all samples are < 50 mg/kg then no further investigation is required (i.e. step-out decision unit samples are not required).
- If the data does not indicate that all samples are < 50 mg/kg, then data will be reviewed with the NYSDEC and additional locations may be selected for investigation (additional step-out locations).

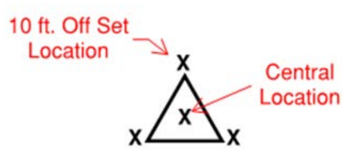
An evaluation of the collected data will be performed during the remedial design in order to determine the appropriate remedial action and define any dredging that may be required. The following factors, as specified in the ROD, would be considered during remedial design in determining the appropriate remedial action:

- Depth of PCB exceedances
- Type of environment (erosion or deposition)
- Thickness of clean sediment above the PCB exceedances
- Duration of dredging and associated potential for migration of re-suspended sediments
- Area weighted surface concentrations of PCBs

3.1.6 Task 4: Variability of Sediment Concentrations

Based on the results from the initial sampling, locations may be selected to help assess the contaminant mass distribution in relevant areas. Three additional cores would be added in close proximity to the location being evaluated with samples collected at corresponding intervals.

Based on a review of data collected in Tasks 1-3, additional samples may be proposed to assess the variability of the sediment concentrations to better understand if the concentrations are uniform or if exceedances are sporadic. For example, the presence of a contiguous area of high contamination could be considered differently than an area with highly variable concentrations with an average concentration much lower than the maximum detection. The variability of the data collected during the initial sampling will be evaluated to determine if this supplemental information could be relevant to determining the appropriate remedial action. Target locations may include some of the VC-101 thru VC-108 investigation units but could also include other locations. The sampling procedure would include three additional sediment cores offset approximately 10 feet from the point being evaluated (see diagram below). Samples would be collected at one-foot intervals up to 4 feet deep or as needed to assess concentrations relevant at the location being evaluated. Results of each cluster of samples will be evaluated to determine if additional investigation is required and then recorded for use during remedial design.



3.2 Laboratory Testing

Sediment sample analysis will be conducted at a New York State qualified laboratory, in accordance with the Quality Assurance Project Plan (QAPP). Samples will be analyzed according to USEPA Method 8082A. Appropriate QA/QC samples will be collected and analyzed based on the procedures and requirements outlined in the QAPP.

The following table provides a summary of the proposed deepwater sediment sample analyses:

PDI Activity	No. of Samples	Medium/Matrix	Sampling Depths (feet)	Analytical Parameter
Investigation Unit Re-sampling (Task 1)	7 samples per core	Sediment	0-0.5 (ponar) 0.5-1 1–2 2-3 3-4 4-6 6-8	PCBs
Investigation Unit Sampling (Task 2)	7 samples per core	Sediment	0-0.5 (ponar) 0.5-1 1–2 2-3 3-4 4-6 6-8	PCBs
Decision Unit Sampling (Task 3)	7 samples per core	Sediment	0-0.5 (ponar) 0.5-1 1–2 2-3 3-4 4-6 6-8	PCBs
Sediment Variability (Task 4)	4 samples per core 3 additional cores per location	Sediment	0.5-1 1–2 2-3 3-4 or as needed	PCBs

3.3 Relevant Field Operating Procedures

Field investigations will be performed in general accordance with the following Operating Procedures (OPs). Refer to Appendix A.

OP2000 - Monitoring Field Explorations
OP2001 - Identification and Description of Soils Using Visual-Manual Methods
OP3001- Preservation and Shipment of Environmental Samples
OP3004 - Sediment Sampling
OP3026 - Chain of Custody
OP3029 – Field Data Recording

3.4 Vibracoring

Vibracoring sampling techniques will be used to collect sediment core samples at each of the proposed Deepwater Investigation sampling locations (except for the surface ponar grabs). Vibracoring is the process of collecting samples within core liners that provide a continuous, minimally disturbed sediment core sample from unconsolidated sediments.

Various sediment coring techniques were evaluated for use during the proposed Deepwater Investigation. Vibracoring was chosen due to several factors including; sediment properties, prior successful use in the proposed investigation areas, minimal sediment compaction throughout length of core, minimal sediment disturbance throughout length of core, and greater recovery potential of sediment sample. Where allowable according to sediment properties and density, sediment coring may be conducted without introduction of vibrations, to further decrease the potential for disturbance of near surface sediment. Due to potential disturbance of the 0-0.5 foot interval ponar grabs will be collected for this interval.

While some debris may be encountered, requiring adjustment of sample locations, the extent and type of debris in the investigation area is not expected to interfere with sample collection. The depth of the silt and sediment has been previously documented and therefore reducing the potential for issues related to a false indication of "refusal" resulting from debris.

The sediment-related exploration and sampling program discussed herein will be conducted by the coring subcontractor along with a Haley & Aldrich representative on board a sampling vessel, outfitted with sediment sampling equipment for acquisition of data in shallow and deepwater environments, along with typical oceanographic and marine navigation equipment.

The coring subcontractor will maintain at least a two-person crew during the sampling survey to navigate the vessel, perform the sediment coring, and collect sediment samples. A Haley & Aldrich representative will be on board during the program to document field observations and to assist with the sediment sampling. Sediment coring will be collected from the sampling vessel at locations shown on Figure 5-1.

4. QUALITY ASSURANCE

Appendix A of the RDWP provides a Quality Assurance Project Plan (QAPP).

5. SUBMITTALS

Applicable data will be included in the PDI Data Summary Report.

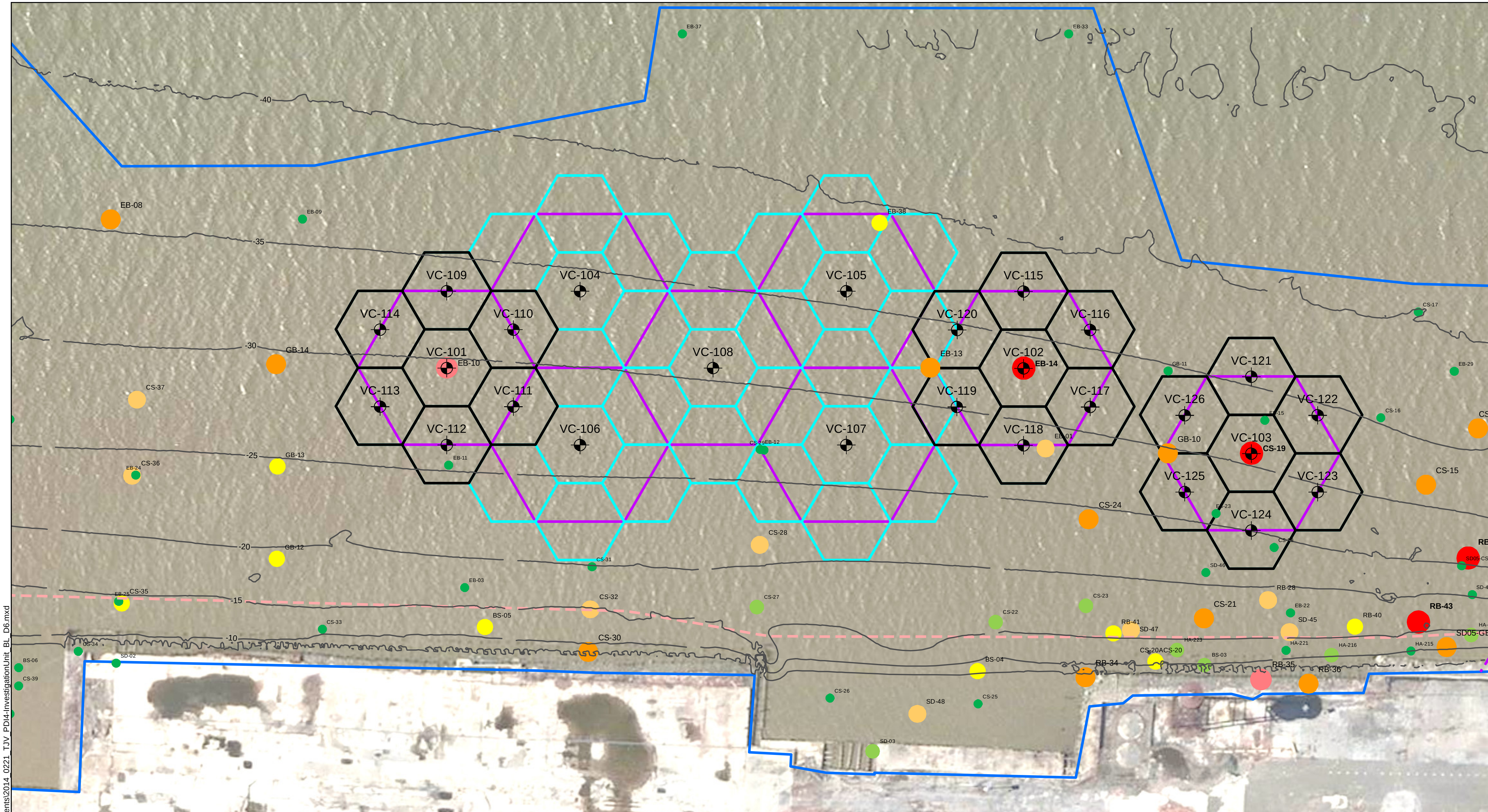
6. HEALTH AND SAFETY

Health and safety requirements applicable to all persons entering the site or involved in field activities are described in the Site-specific Health Safety Security and Environmental Plan (HSSEP), these documents will be available for use on Site prior to the commencement of work.

7. ATTACHMENTS

Figure 5-1 –Deepwater Investigation Locations

https://hank.haleyaldrich.com/sites/projects/28612/Shared Documents/RDWP/RDWP App 5/2014-0213-rjs-App 5_D4.docx



BATHYMETRIC CONTOUR
SILT CURTAIN
NORTHWEST EXTENSION
OU-2 BOUNDARY
INVESTIGATION UNIT

POTENTIAL DECISION UNIT (AS REQUIRED BASED ON TASK 2 RESULTS)
DECISION UNIT (BASED ON TASK 1 LOCATIONS)
SAMPLE LOCATION

0-1 mg/kg
1 - 2 mg/kg
2 - 5 mg/kg
5 - 10 mg/kg
10 - 50 mg/kg
50 - 100 mg/kg
>100 mg/kg

NOTES:
1) AIR PHOTO COURTESY OF TERRASERVER, 2012.
2) BATHYMETRY COURTESY OSI, INC., 2013.

0 100 200
SCALE IN FEET

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

DEEPWATER INVESTIGATION LOCATIONS

SCALE: AS SHOWN
FEBRUARY 2014

FIGURE 5-1

G:\Projects\28612\Global\GIS\Map Documents\2014_0221_TJV_PDI4-InvestigationUnit_BL_D6.mxd

APPENDIX 6

Off-shore Pre-delineation Plan

APPENDIX 6

OFFSHORE PRE-DELINEATION PLAN

1. INTRODUCTION

This plan describes pre-delineation for remedial dredging. This investigation is part of the overall pre-design investigation (PDI) that will be completed at the Former Anaconda Wire & Cable Company site (Site), NYSDEC Site # 3-60-022, located on the east shore of the Hudson River at 1 River Street, Hastings-on-Hudson, New York.

2. BACKGROUND

The Record of Decision (NYSDEC, 2012) for Operable Unit No. 2 (OU-2) calls for removing sediment containing greater than 1 ppm PCB and metals exceeding background from the nearshore and backwater areas, where the potential for public health and environmental exposures are most likely. For the deepwater areas where dredging activities cannot be fully contained, the ROD indicates that the selected remedy removes PCBs in targeted areas at a higher threshold. Specifically, the ROD states:

Removal of sediment and fill that contains PCB concentrations greater than 1 ppm and/or copper, zinc and lead concentrations above the background concentrations listed in Table 2 of Exhibit A, to a maximum excavation depth of 6 feet within the area where sediment resuspension controls, such as a fixed silt curtain, are feasible. This area generally corresponds to a water depth of 15 feet and a distance from the shoreline into the river of approximately 60 to 80 feet and along approximately 2000 feet of shoreline.

Removal of sediment from a targeted area outside the northwest extension area in deeper than 15 feet of water that is defined by PCB concentrations greater than 50 ppm, to maximum depth of 6 feet. During the design, sampling will be performed to determine whether additional areas of PCBs greater than 50 ppm exist. Based upon an evaluation of the significance of the distribution of contaminants and the feasibility of removal, additional areas of sediment may be targeted for dredging.

3. SCOPE OF WORK

The purpose of this investigation is to examine the various offshore areas where PCBs or metals in excess of project-specific criteria (criteria) are known or suspected to be present, in order to gather supplementary data for making decisions regarding remedial action.

This investigation will include delineation activities in three areas shown in Figures 6-1 and 6-2, and described below. The purpose of the delineation work is to further define vertical and lateral remediation boundaries within the targeted OU-2 offshore sediment delineation areas, based on sediment concentrations above PCB and metals criteria.

- **Nearshore Areas**
  The nearshore portion of the Offshore Pre-Delineation program (Figure 6-1) will consist of delineating sediment present in excess of criteria in the areas along the site shoreline defined by the expected silt curtain alignment on the west and the OU-1/OU-2 Boundary on the east (i.e., river area where mudline is shallower than El. -15).

- **Backwater Areas**
The backwater portion of the Offshore Pre-Delineation program (Figure 6-1) will consist of delineating the sediment present in excess of criteria in the backwater areas of the site located within the nearshore portion of OU-2 boundary, at the area of slower river velocities and increased deposition; namely, the Old Marina, North Boat Slip, and South Boat Slip areas.

- **Deepwater Areas (adjacent to the Northwest Offshore Area)**
The deepwater portion of the Offshore Pre-Delineation program (Figure 6-2) will consist of delineating the sediment with PCBs in excess of 50 ppm in a localized offshore area west of the bulkhead extension where dredging has been specified by the ROD. Sampling in other deepwater areas (see RDWP Appendix 5) is similar but has a focus on investigation of data gaps rather than refining dredging limits specified by the ROD.

3.1 Sampling Program Design

Existing data collected and evaluated from the nearshore, backwater, and deepwater delineation areas of the OU-2 site have been limited in scope, with varying depth intervals sampled and inconsistencies identified in spatial distribution of sampling locations. The existing data was sufficient for completion of the feasibility study but the following supplemental data is necessary for further delineation of areas for potential remedial action. A gridded sampling program was developed, with consistent sampling intervals and spacing, to be conducted across much of the nearshore and portions of the backwater areas to address these data gaps and to better delineate the presence and concentration of sediment exceeding criteria. A step-out sampling approach was developed in other appropriate areas of OU-2 including portions of the deepwater and backwater.

The OU-2 delineation data set obtained from this sampling program will be evaluated and incorporated, along with existing data, into the design of the dredging program.

Sediment samples will be collected and submitted for analysis for PCBs and metals (copper, lead and zinc) according to the requirements and procedures described in this plan and the pertinent operating procedures (OPs).

This program selected vibracore technology to collect sediment cores for sampling based on successful historical sampling programs at the site, among other reasons (see Section 3.5). Vibracore along with ponar grabs for surface samples will be collected from barge or boat-mounted equipment. The vibracore diameter is anticipated to be 4 inches but may be changed in the field based on sediment conditions and recovery. Up to approximately 7 feet of sediment will be sampled at each of the proposed locations to be consistent with the maximum depth of dredge as specified in the ROD and to document sediment concentrations that will be left in place. Re-sampling will be completed for deepwater locations to confirm depth and concentration data and provide reference for step-out sampling. Additional re-sampling may also be conducted at other previously sampled locations to confirm existing data where elevated PCB and metals concentrations were detected. It should be noted that additional sampling may be required to fully document the sediment concentrations remaining after remedial action.

Sample locations will be documented using a survey grade differential GPS with a sub-meter accuracy along with a depth sounder as necessary.

3.1.1 Vertical Distribution of Samples

The following approach will be used to establish vertical sample intervals to delineate PCB and metal concentrations in targeted sediment deposits:

Below is a list of depth intervals and rationale for sampling:

- 0-0.5 foot:
  - Consistent with previous sampling programs as the surface sediment sampling interval
  - Represents the zone with highest bioactivity
  - Collected using petit ponar sampler or equivalent
  - Represents the most recently deposited sediments
- 0.5-1 foot:
  - Supplement the surface sampling interval to maintain continuous sampling
- One foot sampling intervals from 1 to 7 feet:
  - Define vertical thickness of impacted sediment,
  - Provide appropriate dredge limits and to prevent unnecessary over-dredging
  - Document sediment concentrations that will be left in place after remedial action

Note that if the preceding shallower interval is less than the criteria then the deeper interval(s) (>4 foot) would not be analyzed. Concentration levels associated with the deepest analyzed interval will be discussed with the DEC prior to discarding archived deeper samples to determine whether further analysis is warranted.

3.1.2 Spatial Distribution of Samples

Sampling locations were selected based on the following spatial (horizontal) distributions and considered the presence of existing data. The sampling program employs a sampling grid in order to fill data gaps or address uneven distribution of existing data. Grid spacing is approximately 80 feet and will provide a consistent basis for understanding the distribution of contaminants in the sediment to refine dredge extents and provide a basis for remedial design. Additionally, step-out sampling will be implemented where required to adequately delineate locations where spatial extents are not fully bounded.

It is anticipated that the dredging program will be defined by grid areas to a corresponding depth interval unless additional data is available to refine dredge extents.

3.1.3 Nearshore Areas

The nearshore portion of this delineation program will be conducted to further assess and delineate sediment exhibiting concentrations in excess of criteria within the top 6 feet of sediment column in OU-2. This area is generally within approximately 15 feet of water depth, corresponding to approximately 60 to 80 feet west of the OU-1 shoreline boundary. Refer to Figure 6-1 for proposed nearshore sampling locations.

A grid based sampling program (as discussed above) will be utilized to provide a current and consistent data set over the nearshore area. Sampling and analysis for PCBs and metals (copper, lead, zinc) will be conducted in sediments up to 7 feet deep in the sediment column. Up to eight samples (dependent upon core recovery) will be collected from each sediment core.

Since this is a grid based sampling program, step-out sampling is not part of this task. Results will be evaluated to determine if additional action is required (e.g. higher density sampling) and then recorded for use during remedial design.

3.1.4 Backwater Areas

Similar to the nearshore delineation program, the backwater portion of the delineation program will be conducted to further delineate sediment exhibiting criteria exceedances in OU-2. Refer to Figure 6-1 for proposed backwater sampling locations.

The Backwater Area is divided into the three following delineation areas; Old Marina Area located at the northern limit of the site, North Boat Slip Area located in the central portion of the offshore site, and the South Boat Slip Area located at the southern end of the site. Refer to

- **North Boat Slip Area**
  A grid based sampling program (as discussed above) will be utilized where existing data gaps have been identified in this area. Sampling and analysis for PCBs and metals (copper, lead, zinc) will be conducted in sediments up to 7 feet deep in the sediment column. Up to eight samples (dependent on core recovery) will be collected from each sediment core advanced at the North Boat Slip sampling locations, representative of the target depth intervals.

- **South Boat Slip Area**
  A step-out sampling program will be used to sample four locations around the previously sampled CS-38 location which identified a significant lead exceedance within the 0-2 foot interval. This location will be resampled and 4 surrounding sample will be place at a 20 foot offset. Sampling and analysis for lead will be conducted in sediments up to 7 feet deep in the sediment column. Eight lead samples will be collected from each sediment core advanced at the South Boat Slip sampling locations, representative of the target depth intervals. Additional step-out locations will be added if exceedances of criteria are identified in the initial samples.

- **Old Marina Area**
  A grid based sampling program (as discussed above) will be utilized where existing data gaps have been identified in this area. Sampling and analysis for PCBs and metals (copper, lead, zinc) will be conducted in sediments up to 7 feet deep in the sediment column. Four Old Marina delineation sampling locations were chosen based on; existing sampling locations and data; the potential source of criteria exceedance located in the southeastern portion of the Old Marina area near a potential building 52 outfall and where data gaps have been identified within this backwater area.

  The delineation sampling will be focused in the southeastern portion of the Old Marina area adjacent to the existing RB-37 sampling location where PCBs were detected at 22 mg/kg (0.0-0.5 foot depth below sediment surface), and where data gaps are present. The proposed grid will be extended north if additional delineation is required with supplementary locations added based on the results of the previous sampling. Additional sampling is not currently proposed at the western portion of the Old Marina since existing data is sufficient for delineation, and the area is bound to the south by the shoreline.

Sampling locations may be adjusted in the field according to access due to the numerous existing wooden piles and the shallow water depths currently present in the Old Marina backwater area.

As in Section 3.1.3; results will be evaluated to determine if additional action is required (e.g. higher density sampling) and then recorded for use during remedial design.

3.1.5 Deepwater Areas (adjacent to the Northwest Offshore Area)

The deepwater portion of the offshore delineation program will consist of further assessing and delineating the presence of sediments that exceed the PCB criteria. Evaluation of sampling results will be consistent with areas addressed as part of the Deepwater Investigation Plan (Appendix 5). Previous samples indicated PCB exceedances of criteria are either within the top 3 or 6 feet of the sediment column, but there is insufficient data to evaluate whether they are isolated. Re-sampling will be completed for these locations to confirm depth and concentration data, to provide reference for additional sampling and to provide a more accurate representation of current conditions. Sediment sampling depths and sediment thickness inconsistencies are anticipated between the historic sample locations and proposed confirmatory sampling locations due to sediment deposition since the previous sampling. Proposed new sample locations were established on a step-out system where three to four locations will be sampled within approximately 25 feet of the original impacted sampling locations. This additional sampling will provide data to assess whether additional investigation is required and support determination of deepwater dredge limits during design. Refer to Figure 6-2 for proposed deepwater delineation sampling locations.

The Deepwater delineation area is located offshore immediately west and southwest of the Northwest Off-shore area portion of OU-2 up to approximately 225 feet from the shoreline, as shown in the ROD, and can be further divided into the two following areas:

- **Shallow Contamination Area (up to 2 feet)** – Where dredging up to 2 feet, areas will initially evaluate a 3 foot depth and further delineated for PCB concentrations greater than 50 mg/kg.

- **Deep Contamination Area (up to 6 feet)** – Where dredging up to 6 feet, areas will evaluate a 7 foot depth and further delineated for PCB concentrations greater than 50 mg/kg.

Approximately eight (8) samples will be collected from each sediment core advanced at the deep water locations, representative of the target depth intervals. Within the Shallow Contamination Area, samples collected to 3 foot depths will be analyzed with remaining samples analyzed if the preceding shallower interval is greater than the criteria. Within the Deep Contamination Area, all sample depths will be analyzed. Note that concentration levels associated with the deepest analyzed interval will be discussed with the DEC prior to discarding archived deeper samples to determine whether further analysis is warranted.

If required, additional step-out sampling locations will be based on consideration of the previous sample results in consultation with the NYSDEC.

Sampling Goals for Each Existing Location

Each location is discussed below to establish the special conditions considered for constructing step-out sampling locations. Values below are mg/kg (ppm) for PCBs. (See Figure 6-2)

Existing Shallow PCB Criteria Exceedance Sample Locations:

- RB-43: Proposed step-out north, south and west. East bounded by silt curtain.

Location	0-0.5 ft	0.5-2 ft	2-4 ft	4-6 ft	6-8 ft
RB-43	1.41	490	5.2	--	ND

- RB-12: Proposed step-out north, south and west. East bounded by Northwest Extension Bulkhead. Surface grabs in the vicinity include RB-22 (17 mg/kg).

Location	0-2	2-4 ft	4-6 ft	6-8 ft
RB-12	69	2.2	ND	--

- SD-53, RB-11 and SD-52: Potential contiguous area with step-outs surrounding these points. The existing location CS-11 provides sufficient data for the step-out in the direction of this sample. East bounded by Northwest Extension Bulkhead and associated sampling. Surface grabs in the vicinity include RB-23 (0.7 mg/kg) and BS-02 (1.0 mg/kg).

Location	0-2	2-4 ft	4-6 ft	6-8 ft
SD-53	1960	24.7	9.5	4.5
RB-11	5200	--	--	170
SD-52	153	31.1	290	34.3

Step-out	0-0.5 ft	0.5-2 ft	2-3.8 ft	3.8-4.3 ft	4.3-8 ft
CS-11	ND	ND	ND	ND	--

- RB-14 and CS-12: Potential contiguous area with step-outs surrounding these points. The existing location SD02-CS provides sufficient data for the step-out in the direction of this sample. Surface grabs in the vicinity include SD02-CS (1.0 mg/kg) as shown below.

Location	0-0.5 ft	0.5-3 ft		3-6 ft	6-8 ft
RB-14	120	0.058		ND	0.085
	0-0.5 ft	0.5-2.4 ft	2.4-2.9 ft	3-6 ft	6-8 ft
CS-12	170	ND	ND	--	--

Step-out	0-0.5 ft	0.5-8 ft
SD02-CS	0.99	--

Existing Deep PCB Criteria Exceedance Sample Locations:

- RB-42 and RB-21: Step-out locations to evaluation/delineation and/or to confirm concentration levels and thickness of sediments above the PCB exceedances. Surface grabs in the vicinity include SD05-CS (0.4 mg/kg) and SD02-GB (0.4 mg/kg) respectively.

Location	0-0.5 ft	0.5-2 ft	2-3 ft	4 ft	6-8 ft
RB-42	0.417	0.235	7.9	420	0.074
	0-0.5 ft	0.5-2 ft	2-3 ft	4-5ft	5-6 ft
RB-21	13	30	15	1400	6.9

Evaluation of Data

Results from each interval for each location will be used to characterize each location and will be used to determine if additional investigation for that location is required.

- If perimeter step-out data indicates all samples are < 50 mg/kg then no further investigation is required (i.e. additional step-out samples are not required).
- Additional investigation requirements will be based on consultation with the NYSDEC and will consider:
  - Depth and thickness of PCB exceedances
  - Variability of concentrations
  - Type of environment (erosion or deposition)
  - Concentration levels and thickness of sediments above the PCB exceedances

3.2 Tidal Schedule

Sampling scheduling and sequencing of sampling efforts will be affected by and adjusted to tidal ranges present in the Hudson River due to shallow water depths present in several of the nearshore and backwater sampling locations.

3.3 Laboratory Testing

The following table provides a summary of the proposed deepwater sediment sample analyses:

PDI Activity	No. of Samples	Medium/Matrix	Sampling Depths (ft.)	Analytical Parameter
Nearshore	21 sampling locations 8 samples per location	Sediment	0-0.5, 0.5-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7	PCBs, Metals (Cu, Pb, Zn)
Backwater	**Old Marina**: 4 sampling locations 8 samples per location	Sediment	0-0.5, 0.5-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7	PCBs, Metals (Cu, Pb, Zn) (*South Slip, Pb only)
	North Slip: 2 sampling locations 8 samples per location			
	South Slip: 5 sampling locations 8 samples per location			
Deepwater	**2 foot**: 25 sampling locations 8 samples per location	Sediment	0-0.5, 0.5-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7	PCBs
	6 foot: 8 sampling location 8 samples per location			

Sediment sample analysis will be conducted at a New York State qualified laboratory, in accordance with the Quality Assurance Project Plan (QAPP). Samples will be analyzed according to USEPA Method 8082A. Appropriate QA/QC samples will be collected and analyzed based on the procedures and requirements outlined in the QAPP.

3.4 Relevant Field Operating Procedures

Field investigations will be performed in general accordance with the following Operating Procedures (OPs). Refer to Appendix A.

OP2000 - Monitoring Field Explorations
OP2001 - Identification and Description of Soils Using Visual-Manual Methods
OP3001- Preservation and Shipment of Environmental Samples
OP3004 - Sediment Sampling
OP3026 - Chain of Custody
OP3029 – Field Data Recording
OP3030 - Field Instruments: Use and Calibration

3.5 Vibracoring

Vibracoring sampling techniques will be used to collect sediment core samples at each of the proposed Offshore Pre-Delineation sampling locations (except for the surface ponar grabs). Vibracoring is the process of collecting samples within core liners that provide a continuous, minimally disturbed sediment core sample from unconsolidated sediments.

Various sediment coring techniques were evaluated for use during the proposed Offshore Pre-Delineation. Vibracoring was chosen due to several factors including: sediment properties, prior successful use in the proposed delineation areas, minimal sediment compaction throughout length of core, minimal sediment disturbance throughout length of core, and greater recovery potential of sediment sample. Where allowable according to sediment properties and density, sediment coring may be conducted without introduction of vibrations, to further decrease the potential for disturbance of near surface sediment (0-0.5 foot). Due to potential disturbance of the 0-0.5 foot interval ponar grabs will be collected for this interval in deepwater areas with shallow contamination.

While some debris may be encountered, requiring adjustment of sample locations, the extent and type of debris in the delineation area is not expected to interfere with sample collection. The depth of the silt and sediment has been previously documented and therefore reduces the potential for issues related to a false indication of “refusal” resulting from debris.

The sediment-related exploration and sampling program discussed herein will be conducted by the coring subcontractor along with a Haley & Aldrich representative on board a sampling vessel, outfitted with sediment sampling equipment for acquisition of data in shallow and deepwater environments, along with typical oceanographic and marine navigation equipment.

The coring subcontractor will maintain at least a two-person crew during the sampling survey to navigate the vessel, perform the sediment coring, and collect sediment samples. A Haley & Aldrich representative will be on board during the program to document field observations and to assist with the sediment sampling. Sediment coring will be collected from the sampling vessel at locations shown on Figures 6-1 and 6-2.

4. QUALITY ASSURANCE

Appendix A of the RDWP provides a Quality Assurance Project Plan (QAPP).

5. SUBMITTALS

Applicable data will be included in the PDI Data Summary Report.

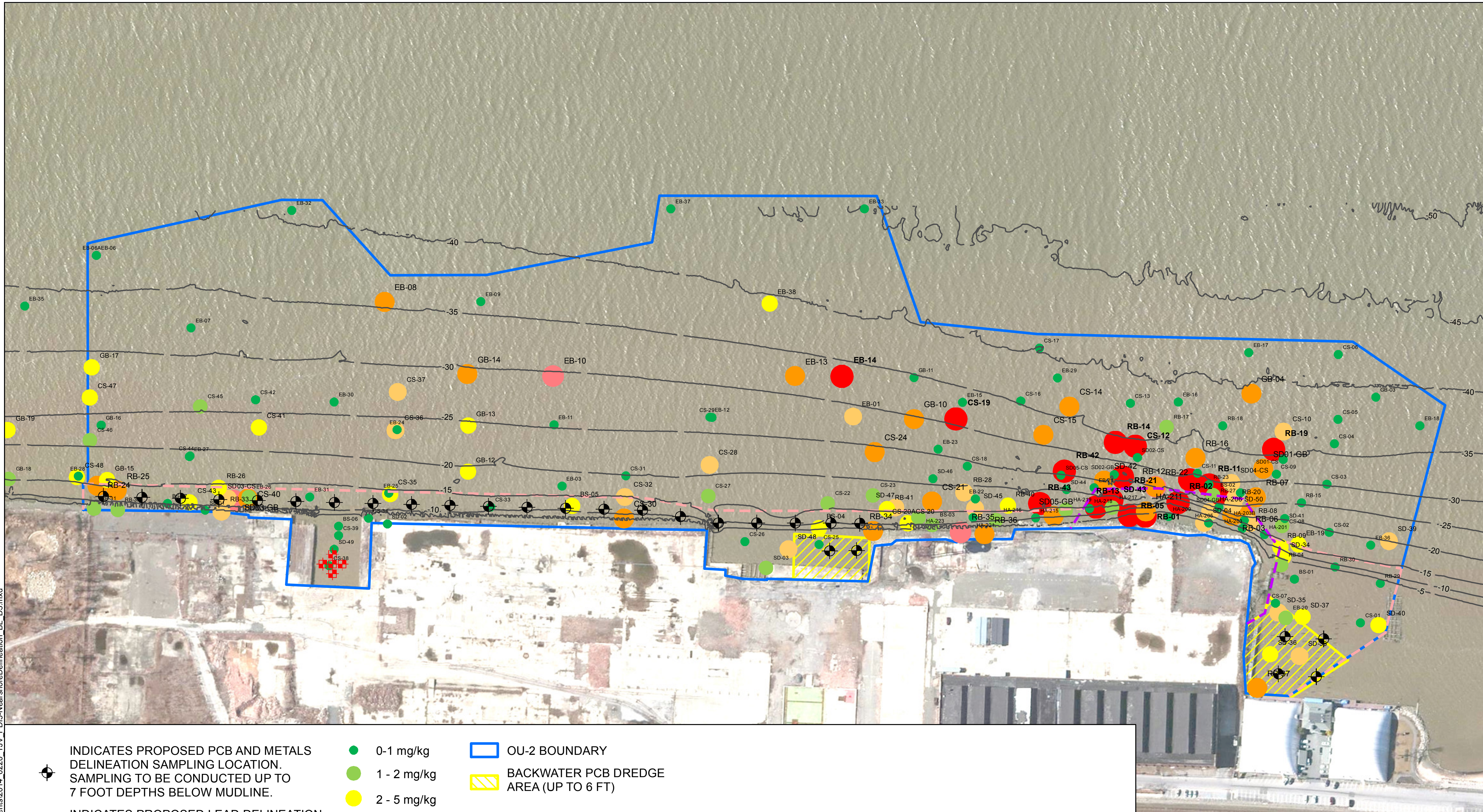
6. HEALTH AND SAFETY

Health and safety requirements applicable to all persons entering the site or involved in field activities are described in the Site-specific Health Safety Security and Environmental Plan (HSSEP), these documents will be available for use on Site prior to the commencement of work.

7. ATTACHMENTS

Figure 6-1 – Nearshore and Backwater Pre-Delineation Sampling Locations
Figure 6-2 – Offshore Pre-Delineation Sampling Locations

https://hank.haleyaldrich.com/sites/projects/28612/Shared Documents/RDWP/RDWP App 6/2014-0218-App 6 - OU-2 PreDelin_D4.docx



INDICATES PROPOSED PCB AND METALS DELINEATION SAMPLING LOCATION. SAMPLING TO BE CONDUCTED UP TO 7 FOOT DEPTHS BELOW MUDLINE.

INDICATES PROPOSED LEAD DELINEATION SAMPLING LOCATION. SAMPLING TO BE CONDUCTED UP TO 7 FOOT DEPTHS BELOW MUDLINE.

BATHYMETRIC CONTOUR

SILT CURTAIN

NORTHWEST EXTENSION

0-1 mg/kg

1 - 2 mg/kg

2 - 5 mg/kg

5 - 10 mg/kg

10 - 50 mg/kg

50 - 100 mg/kg

>100 mg/kg

OU-2 BOUNDARY

BACKWATER PCB DREDGE AREA (UP TO 6 FT)

NOTES:
1) AIR PHOTO COURTESY OF TERRASERVER, 2012.
2) BATHYMETRY COURTESY OSI, INC., 2013 AND MARINE SCIENCES RESEARCH CENTER, 2007.

0 200 400
SCALE IN FEET

HALEY & ALDRICH

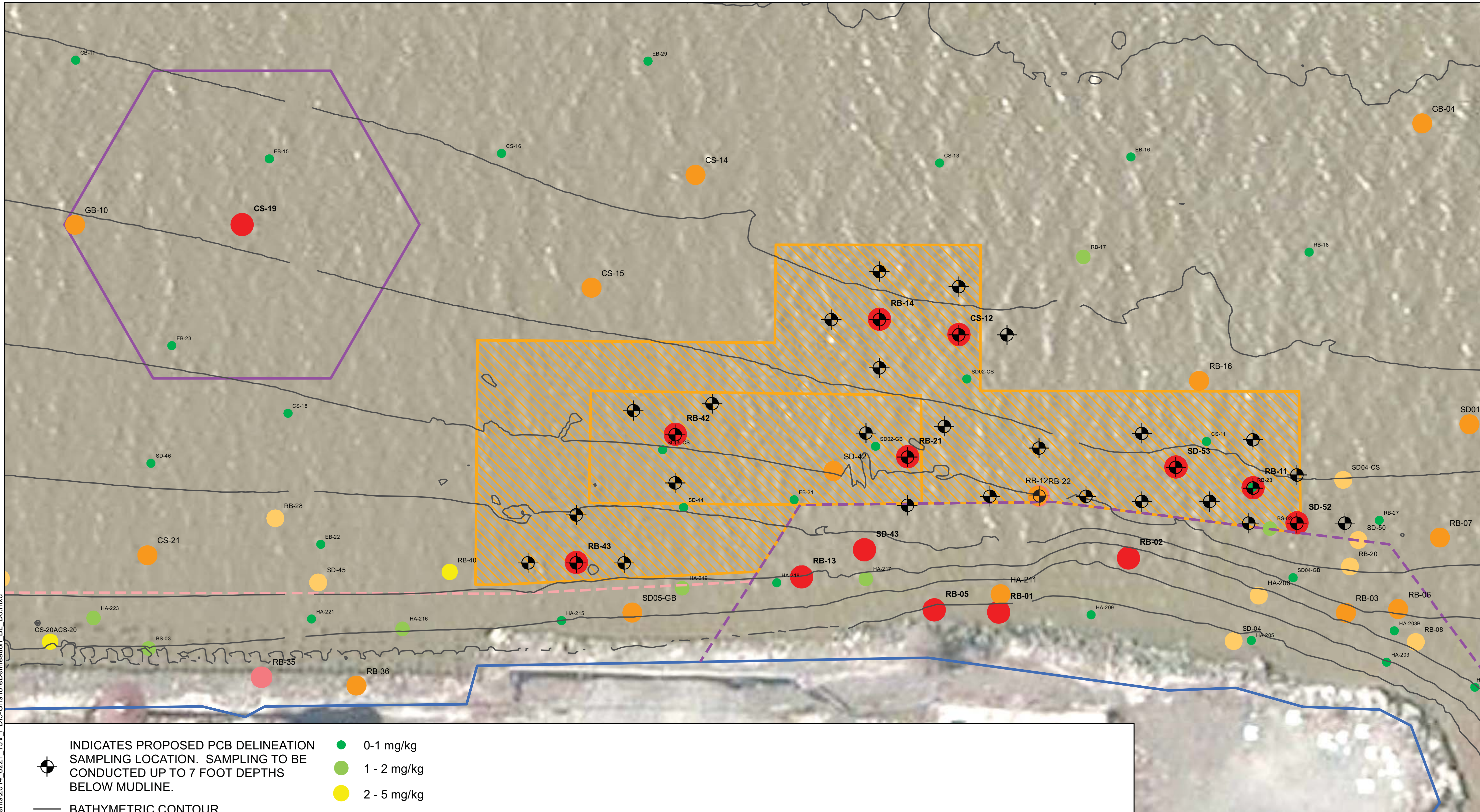
NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

NEARSHORE AND BACKWATER PRE-DELINEATION SAMPLING LOCATIONS

SCALE: AS SHOWN
FEBRUARY 2014

FIGURE 6-1

G:\Projects\28612\Global\GIS\Map Documents\2014_0220_TJV_PDI5-NearshoreDelineation_BL_D5.mxd



INDICATES PROPOSED PCB DELINEATION SAMPLING LOCATION. SAMPLING TO BE CONDUCTED UP TO 7 FOOT DEPTHS BELOW MUDLINE.

BATHYMETRIC CONTOUR

SILT CURTAIN

NORTHWEST EXTENSION

INVESTIGATION UNIT

OU-2 BOUNDARY

DEEPWATER DREDGE AREA (UP TO 6 FT)

0-1 mg/kg

1 - 2 mg/kg

2 - 5 mg/kg

5 - 10 mg/kg

10 - 50 mg/kg

50 - 100 mg/kg

>100 mg/kg

NOTES:
1) AIR PHOTO COURTESY OF TERRASERVER, 2012.
2) BATHYMETRY COURTESY OSI, INC., 2013.

0 50 100
SCALE IN FEET

HALEY & ALDRICH

NYSDEC SITE #3-60-022
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

OFFSHORE PRE-DELINEATION SAMPLING LOCATIONS

SCALE: AS SHOWN
FEBRUARY 2014

FIGURE 6-2

G:\Projects\28612\Global\GIS\Map Documents\2014_0221_TJV_PDI5-OffshoreDelineation_BL_D6.mxd

APPENDIX 7

Geotechnical Exploration Plan

APPENDIX 7

GEOTECHNICAL EXPLORATION PLAN

1. INTRODUCTION

This plan describes geotechnical explorations in OU-1 and OU-2. This task is part of the overall pre-design investigation (PDI) that will be completed at the Former Anaconda Wire & Cable Company site (Site), NYSDEC Site # 3-60-022, located on the east shore of the Hudson River at 1 River Street, Hastings-on-Hudson, New York.

2. BACKGROUND

The remedy described in the OU-1 ROD Amendment and OU-2 ROD requires geotechnical engineering analysis and design. Prior investigations have collected geotechnical data, however, data gaps remain.

3. SCOPE OF WORK

3.1 Purpose and Scope

The purpose of the geotechnical explorations is to provide additional stratigraphy information in several areas: in the general vicinity of the planned deadman anchor (which will be located west of Building 52), in the general vicinity of the planned Northwest Extension bulkhead wall, and in the general off-shore area between the North Boat Slip and the South Boat Slip. The information will be used for bulkhead and deadman design, excavation support design, design of the sloped shore, and general site geotechnical analysis (such as settlement). Up to two test borings on land and up to nine test borings in the river are planned to be drilled at the general locations shown on Figure 7-1.

Additionally, some test pits are planned to be excavated at select locations around the site where sheetpile support of excavation (SOE) is planned to be used during construction (i.e., “hot spot” excavation locations that are about 6 ft bgs or greater), or at existing building foundations. The purpose of the test pits is to gather information on soil conditions, excavation effort, and potential obstructions that could affect the design and/or construction of the sheetpile SOE walls.

3.2 Geotechnical Test Borings

The borings will be advanced using rotary wash drilling techniques. For the offshore borings, the drilling rig will be mounted on a barge. On land, boring locations will be pre-cleared to a depth of approximately 6.5 feet using an air knife or other clearing technique, to check for the presence of utilities.

Samples will be obtained using the Standard Penetration Test (SPT) in general accordance with ASTM D1586, sampling generally every 5 to 10 feet for both on-shore and off-shore borings, except that on land, sampling will be performed continuously (every 2 feet) through the Fill soils or to a depth of at least 12 feet. Some undisturbed samples from the Marine Silt will be obtained using a thin-walled Shelby tube sampler. A 5-foot rock core will be obtained in some of the borings, and the borings will be terminated either 10 feet below the top of the Basal Sand, at the top of rock, or 5 feet below the top of rock, depending on the location.

The estimated depth for on-shore borings is approximately 50 to 100 feet below ground surface, and estimated depth for the off-shore borings is approximately 70 to 100 feet below mudline, depending on location and the termination criteria discussed above.

Soil samples will be visually classified using the Unified Soil Classification System (USCS). The borings will be grouted on completion and cuttings will be drummed for disposal. For the off-shore locations, boring locations will be determined using a barge-mounted GPS unit, and mudline elevations will be approximately determined using an on-site tide board. For the on-shore borings, as-drilled boring locations and ground surface elevations will be determined by survey.

Sampling equipment will be decontaminated between samples and drilling equipment will be decontaminated between locations if required.

The locations of the borings planned to be advanced along the Northwest Extension bulkhead wall will be chosen after completion of the PCBM/Riprap probes described in Appendix 4, so that more information is available relative to the likely location of the wall. In general, the number and locations of the borings shown on Figure 7-1 are approximate and subject to change based on conditions encountered during the work.

3.3 Geotechnical Test Pits

One to two weeks of test pits are planned to be excavated at SOE locations around the site. Preliminary locations are shown on Figure 7-1 but are approximate and subject to change based on conditions encountered during the work. In general, the excavation area will be 4 feet by 10 feet and will be enlarged as necessary based on sidewall stability and field conditions. The excavations will typically be 8 to 12 feet deep. It is anticipated that 2 to 3 test pits will be excavated each day, and that the total number of geotechnical test pits will be on the order of 5 to 10; however, the number of test pits is approximate and subject to change based on the progress of the work and field conditions. Excavation will be performed in accordance with the Atlantic Richfield Remediation Management Defined Practice for Ground Disturbance.

During excavation, excavated soils will be placed on plastic sheeting. At the completion of excavation, the soils will be placed back in the excavation in the reverse order of excavation, so that the soils excavated from the bottom of the pit will be replaced back in the bottom.

3.4 Geotechnical Laboratory Testing

Representative soil samples will be submitted to a geotechnical laboratory and tested for the following parameters. No tests are planned to be performed on rock core samples. Note that some tests may be added or deleted, depending on the number and quality of samples obtained.

- Moisture Content (ASTM D2216)
- Grain-Size Analysis (ASTM D422)
- Atterberg Limits (ASTM D4318)
- Organic Content (ASTM D2974)
- Specific Gravity (ASTM D854)
- One-Dimensional Consolidation (ASTM D4186) (undisturbed samples only)
- UU Triaxial Test (ASTM D2850) (undisturbed samples only)
- CU Triaxial Test (ASTM D4767) (undisturbed samples only)

3.5 Relevant Field Operating Procedures

Field investigations will be performed in general accordance with the following Operating Procedures (OPs), which are provided in Appendix A.

OP1001 – Excavation and Trenching
OP1002 – Drilling Safety
OP1004 – Operation / Calibration of PID Photoionization Detector
OP1008 – Operations Over, Near, or On Water
OP1020 – Work Near Utilities
OP2000 – Monitoring Field Explorations
OP2001 – Identification and Description of Soils Using Visual-Manual Methods
OP2005 – Test Borings, Sampling, Standard Penetration Testing and Borehole Abandonment
OP2007 – Undisturbed Fixed Piston Tube Sampling

4. QUALITY ASSURANCE

Appendix A of the RDWP provides a Quality Assurance Project Plan (QAPP).

5. SUBMITTALS

Applicable data will be included in the PDI Data Summary Report.

6. HEALTH AND SAFETY

Health and safety requirements applicable to all persons entering the site or involved in field activities are described in the Site-specific Health Safety Security and Environmental Plan (HSSEP), these documents will be available for use on Site prior to the commencement of work.

7. ATTACHMENTS

Figure 7-1 Proposed Exploration Location Plan: Geotechnical Explorations

W
S N
E

0 100 200 300 400
SCALE IN FEET

LEGEND

PD2-GR-009 — DESIGNATION AND APPROXIMATE LOCATION OF PROPOSED GEOTECHNICAL TEST BORING. NUMBER AND LOCATION OF EXPLORATIONS IS SUBJECT TO CHANGE BASED ON FIELD CONDITIONS.

PROPOSED TEST PIT LOCATIONS. NUMBER OF TEST PITS AND LOCATIONS ARE APPROXIMATE AND SUBJECT TO CHANGE BASED ON SITE CONDITIONS.

PROPERTY LINE

RAIL ROAD

EXISTING STRUCTURES

NORTHWEST EXTENSION WALL LOCATION

NOTES

1. PROPERTY BOUNDARY INFORMATION PROVIDED BY WENDEL COMPANIES, DRAWING XVE-HUDSON-TOPO.DWG, PROJECT NO. 438504, DATED SEPTEMBER 21, 2012.
2. GRID SYSTEM IS THE NEW YORK STATE PLANE COORDINATE SYSTEM, EAST ZONE, NAD 83, U.S. SURVEY FEET.
3. SHORELINE AND ONSHORE FEATURES ARE APPROXIMATE AND ARE BASED ON DIGITAL ORTHOPHOTO QUADRANGLES FLOWN IN 2009 AND OBTAINED FROM THE NEW YORK STATE GIS CLEARINGHOUSE (NYGIS).
4. THE CONTOUR INFORMATION PRESENTED ON THIS DRAWING REPRESENTS THE RESULTS OF A SURVEY PERFORMED BY OCEAN SURVEYS, INC. ON 10-16 DECEMBER 2012 AND CAN ONLY BE CONSIDERED AS INDICATING THE CONDITIONS EXISTING AT THAT TIME.

HALEY & ALDRICH

PRE-DESIGN INVESTIGATION
NYSDEC SITE #3-60-022
HASTINGS-ON-HUDSON, NEW YORK

PROPOSED LOCATION PLAN - GEOTECHNICAL TEST PITS

SCALE: AS SHOWN
FEBRUARY 2014

FIGURE 7-1

Drawing Name: S:\28612_HASTINGS\286\CAD\28612-286_007 PROP TEST PITS R2.DWG
Operator Name: POSTOLOWSKI, KEVIN
Drawing Layout: FIGURE 7-1
Plot Date: February 20, 2014

APPENDIX 8

Bench Tests

APPENDIX 8
BENCH TEST WORK PLANS

1. INTRODUCTION

This plan describes bench tests to support remedial design. This task is part of the overall pre-design investigation (PDI) that will be completed at the Former Anaconda Wire & Cable Company site (Site), NYSDEC Site # 3-60-022, located on the east shore of the Hudson River at 1 River Street, Hastings-on-Hudson, New York.

2. BACKGROUND

Design of the site remedy may include management of saturated soils and sediment, treatment of water during construction and long-term treatment of groundwater as part of a groundwater management system. The following sections provide the specific bench scale testing to address these potential design scenarios for the remedial design.

3. SCOPE OF WORK

Prior to remedial design at the Site, a series of bench-scale treatability tests will be performed to identify effective treatment technologies and associated design parameters for the potential full scale system. These technologies include:

- Solids Dewatering: Methods and basic design parameters for the dewatering of water-laden excavated soils and dredged sediments;
- Stabilization: Methods and basic design parameters for the solidification of construction materials to be re-used on-site for various purposes, which may include structural fill;
- Construction Water Treatment: Methods and basic design parameters for the potential treatment of various metals and PCBs in water generated during construction activities (e.g., solids dewatering supernatant and on-shore excavation dewatering); and
- Long-Term Groundwater Treatment: Initial testing of treatment methods for residual groundwater: to screen technology and provide basic design parameters for further testing, if needed.

The results of the bench testing will be used during design for process selection and equipment specification.

The following sections outline the procedures and methods to be used during bench-scale testing.

3.1 Solids Dewatering

The purpose of this bench test is to measure the effectiveness of two dewatering techniques (gravity settling and plate-and-frame filtration) on the dewatering of recovered saturated solids which will be generated during remedial construction.

On-shore soils dewatering was bench tested in 2006. Bench testing results indicated that gravity settling was ineffective in meeting Liquid Release and Paint Filter testing for material transport; however filter press operation at 100 psig was sufficient to meet these requirements. Similar testing will be performed on sediments, identifying the effectiveness of dewatering for both on-site treatment (e.g., solidification) and off-site transport.

Sediment will be tested for the effectiveness of both gravity settling and plate-and-frame filtration. The sediment will be tested under two conditions: the raw material and the raw material with diatomaceous earth added as a dewatering aid. After each test, sediment will be tested for the appropriate parameters for design purposes.

3.1.1 Sampling:

Two, 2-gallon samples of sediments will be obtained as a part of the sampling program. Samples will be composited in the lab and kept at 4 degrees C for the duration of the test.

Samples for testing: The composite will be split into two (2) samples and prepared for testing, as follows:
(1) Raw Sample; and
(2) Raw sample with added 5% diatomaceous earth.

Analysis of the raw composite will be as follows:
(1) Moisture content;
(2) Solids content;
(3) Paint Filter Test;
(4) Grain Size Distribution; and
(5) Atterburg Limits.

3.1.2 Gravity Drainage Testing:

Gravity drainage testing will be performed to evaluate the reduction in moisture content that can be achieved by allowing the site material to gravity drain while stockpiled during field operation. Appropriate volumes of each of the samples will be placed in a Buchner funnel with filter paper and covered. A sample of each sediment will be removed at days 3, 5, and 7 and tested for the following parameters:
(1) Mass of filter cake and fluids;
(2) Moisture content; and
(3) Solids content.

Following completion of the 7-day test, the remaining sample will also be analyzed for the following parameters:
(1) Paint Filter; and
(2) Liquid Release Test.

3.1.3 Filter Press Testing:

Filter press testing will be performed to evaluate the reduction in moisture content that can be achieved by the application of a positive pressure to the saturated material. Appropriate volumes of each of the two samples will be placed in a bench filter press apparatus and pressure will be applied until breakthrough occurs. The filter press will likely be tested at the following pressures: 50 psig, 75 psig, 100 psig, 125 psig, and 150 psig, or until the treated sample passes both the Paint Filter and Liquid Release Tests.

Samples will be analyzed for:

(1) Mass of final filter cake and fluids released;
(2) Moisture content;
(3) Solids content;
(4) Paint Filter; and
(5) Liquid Release Test.

3.1.4 Optional Testing

If testing results indicate that diatomaceous earth addition has a beneficial effect on the ability to dewater the sediments, additional testing may be performed to provide testing of sediment with on-site soils used as an additive, rather than diatomaceous earth. Two test runs at the optimum conditions may be performed, with 5% and 10% addition of on-site soils to the sediment prior to dewatering.

3.2 Stabilization

The purpose of this test is to measure the effectiveness of combinations of additives to construction-generated media, to determine the effectiveness of these additives to sufficiently stabilize the material so that on-site re-use is feasible.

Up to three separate sets of tests will be performed on sediments of potentially differing properties; on-shore saturated soils, near-shore sediments and deep-water sediments. Note that physical properties testing of the near-shore and deep-water sediments will verify that sediments have different physical properties. If properties are similar, only two tests will be performed: on-shore soils and (composited) sediments.

Each sample will be tested to determine the effectiveness of the admixtures to provide durable and stable materials for use as fill on-shore at the subject site. Each material shall have a minimum of four admixtures at up to two addition rates tested over time, up to the 28-day point. The most successful admixture for each of the media will be further tested.

3.2.1 Sampling:

Seven (7) to ten (10) 5-gallon samples of each material (on-site saturated soils, near-shore sediment and deep water sediments) will be collected. Samples will be composited in the lab and kept at 4 degrees C for the duration of the test. These samples may also be used for other testing.

3.2.2 Mixture Design:

The testing laboratory will prepare a minimum of four combinations of stabilizing agents for use on each of the samples. Mixtures will include varying percentages of Portland cement, hydrated lime, fly ash, cement kiln dust and/or other additives deemed likely for success by the laboratory.

3.2.3 Mixture Testing:

Each of the additives will be added at a minimum of two addition rates to each of the sample media.

After initial screening of the admixtures, four admixture/ratio combinations will be tested further. Additional composite sediment samples will be utilized and additional mixtures will be prepared for testing. These stabilized samples will be tested for various geotechnical parameters, such as durability and strength.

Based on evaluation of the stabilized materials, additional geotechnical testing may be performed on the two most successful tests. Two samples of each material may be tested for additional strength parameters, to be determined as the program progresses.

3.3 Construction Water Treatment

The purpose is to determine the effectiveness of various water treatment technologies on water generated during construction. Treatment methods to be tested will include filtration, metals precipitation (through pH adjust), and carbon adsorption.

Waters will be tested to determine optimum treatment technologies and initial design parameters for water treatment during construction. On-shore excavation dewatering water as well as supernatant from sediment dewatering (see previous test) will be tested separately for treatment of the primary contaminants of metals and PCBs. A combined stream will be tested at the end for overall acceptability.

3.3.1 Sampling:

Two, 5-gallon samples of site shallow groundwater will be obtained as part of the sampling program. Samples will be composited in the lab and kept at 4 degrees C for the duration of the test.

Ten (10) to fifteen (15) 5-gallon samples of sediments (combined shallow and deep water) will be obtained as a part of the sampling program. Final volumes of sediment required will be dependent on upon the quantity of water that can be extracted from the sediments, as determined in the dewatering bench test (previously described). Sediment samples will be dewatered using the selected method as part of the dewatering bench test. Supernatant water will be collected for testing under this plan.

Each of the water samples will be composited in the lab. Pre-treatment samples of the water will be analyzed for:

(1) Total Metals (Beryllium (Be), Copper (Cu), Lead (Pb)and Zinc (Zn))
(2) Dissolved Metals (Be, Cu, Pb and Zn)
(3) Total Suspended Solids
(4) Total Dissolved Solids
(5) PCBs as Aroclors

3.3.2 Filtration Testing:

A portion of each of the two samples will be passed through progressively smaller filters and analyzed for total metals, solids and PCBs after each filtration. Filtration levels shall include 10 micron, 5 micron, 1 micron, 0.5 micron, and 0.1 micron filters. Results will indicate if filtration alone is sufficient for meeting discharge limitations. Each of the filtered water samples will be analyzed for:

(1) Total Metals (Be, Cu, Pb and Zn)
(2) Dissolved Metals (Be, Cu, Pb and Zn)
(3) Total Suspended Solids
(4) Total Dissolved Solids
(5) PCBs as Aroclors

3.3.3 Precipitation Testing:

A portion of each of the two samples be subject to pH adjust and precipitation testing. Actual pH levels to be tested will be dependent upon concentrations and metals and concentrations present in the raw water. A minimum of three pH levels, varying by a minimum of 0.5 SU will be tested. These tests will be performed with a minimum of two precipitating agents. After pH adjustment, the water sample will be filtered to 10 micron and analyzed for:

(1) Total Metals (Be, Cu, Pb and Zn)
(2) Dissolved Metals (Be, Cu, Pb and Zn)
(3) Total Suspended Solids
(4) Total Dissolved Solids
(5) PCBs as Aroclors

3.3.4 Carbon Adsorption Testing:

A portion of each of the two samples will be subject to Granular Activated Carbon (GAC) adsorption testing. Water samples will be filtered to 10 micron prior to passing through the carbon. A minimum of two carbon types will be tested for each of the two water streams, with two empty bed contact times each, as recommended by the manufacturer. After passing through the carbon bed, the water samples will be analyzed for:

(1) Total Suspended Solids
(2) Total Dissolved Solids
(3) PCBs as Aroclors

3.3.5 Complete System Testing:

After completion of the individual component and water stream testing, a composite of the two water streams will be composited and tested through a complete stream of treatment. This may include filtration, pH adjustment, additional filtration and carbon adsorption, as testing indicates is necessary. Composite water will be tested before and after each unit process, for a total of up to 5 analyses, for the following:

(1) Total Metals (Be, Cu, Pb and Zn)
(2) Dissolved Metals (Be, Cu, Pb and Zn)
(3) Total Suspended Solids
(4) Total Dissolved Solids
(5) PCBs as Aroclors

3.4 Long-Term Groundwater Treatment

Purpose is to provide an initial screening of the effectiveness of several adsorptive media on low flow, passive treatment of groundwater after construction.

On-site groundwater will be tested to determine the long term effectiveness of a low-flow, flow-through carbon adsorption system. This is preliminary testing to provide options for long term treatment of potential low level residual groundwater impacts after the implementation of the remedy.

3.4.1 Sampling:

Four, 5-gallon samples of site shallow groundwater will be obtained as part of the sampling plan. Samples will be composited in the lab and kept at 4 degrees C for the duration of the test. Note: final sample volumes will be based on estimated design flows through the groundwater treatment system.

Each of the water samples will be composited in the lab. Pre-treatment samples of the water will be analyzed for:

(1) Total Metals (Be, Cu, Pb and Zn)
(2) Dissolved Metals (Be, Cu, Pb and Zn)
(3) Total Suspended Solids
(4) Total Dissolved Solids
(5) PCBs as Aroclors

3.4.2 Low Flow Adsorption Testing:

The composite sample will be split into four samples for testing. Two types of GAC will be selected and small samples of each of the GAC will be placed in vessels. Site groundwater will be pumped through the samples at two separate empty bed contact times, designed to simulate flow conditions anticipated to be encountered after remedial construction. Effluent treated groundwater samples will be collected at 50%, 75%, 100%, 125% and 150% of predicted carbon capacity and analyzed for:

(1) Total Metals (Be, Cu, Pb and Zn)
(2) Dissolved Metals (Be, Cu, Pb and Zn)
(3) Total Suspended Solids
(4) Total Dissolved Solids
(5) PCBs as Aroclors

4. QUALITY ASSURANCE

Appendix A of the RDWP provides a Quality Assurance Project Plan (QAPP). Sample container, preservation, handling requirements, reporting limits and data quality indicators for the analyses to be performed will be consistent with analytical methods and procedures provided in the QAPP.

Laboratory data for the analyses will be presented in NYSDEC Analytical Services Protocol Category B (ASP-B) and electronic EQuIS format for data and full data validation as prescribed in Appendix A will be performed.

Estimated sample and analytical quantities are as follows:

Bench Test	*Moisture Content*	*Solids Content*	*Grain Size distribution*	*Atterberg Limits*	*Paint Filter Test*	*Liquid Release Test*	*Geotechnical (TBD)*	*Total Metals*	*Dissolved Metals*	*TSS*	*TDS*	*PCBs as Aroclors*
Solids Dewatering	20	20	2	2	15	15						
Stabilization							50					
Construction Water Treatment								25	25	30	30	30
Long-Term Groundwater Treatment										5	5	5
TOTALS	***20***	***20***	***2***	***2***	***15***	***15***	***50***	***25***	***25***	***35***	***35***	***35***

Analytical Test methods will be as follows:

(1) Total Metals (Be, Cu, Pb and Zn) by EPA 6010C
(2) Dissolved Metals (Be, Cu, Pb and Zn) by EPA Method 6010C
(3) Total Suspended Solids by Standard Methods 2450
(4) Total Dissolved Solids by Standard Methods 2450
(5) PCBs as Aroclors by EPA 8082A

Geotechnical analyses to be performed as part of the Stabilization Bench Test shall be determined at a later time. Reporting limits for likely geotechnical parameters (e.g., Grain size analysis, Atterberg Limits, Triaxial tests, etc.) are included in the QAPP.

5. SUBMITTALS

Applicable data will be included in the PDI Data Summary Report.

6. HEALTH AND SAFETY

Health and safety requirements applicable to all persons entering the site or involved in field activities are described in the Site-specific Health Safety Security and Environmental Plan (HSSEP), these documents will be available for use on Site prior to the commencement of work.